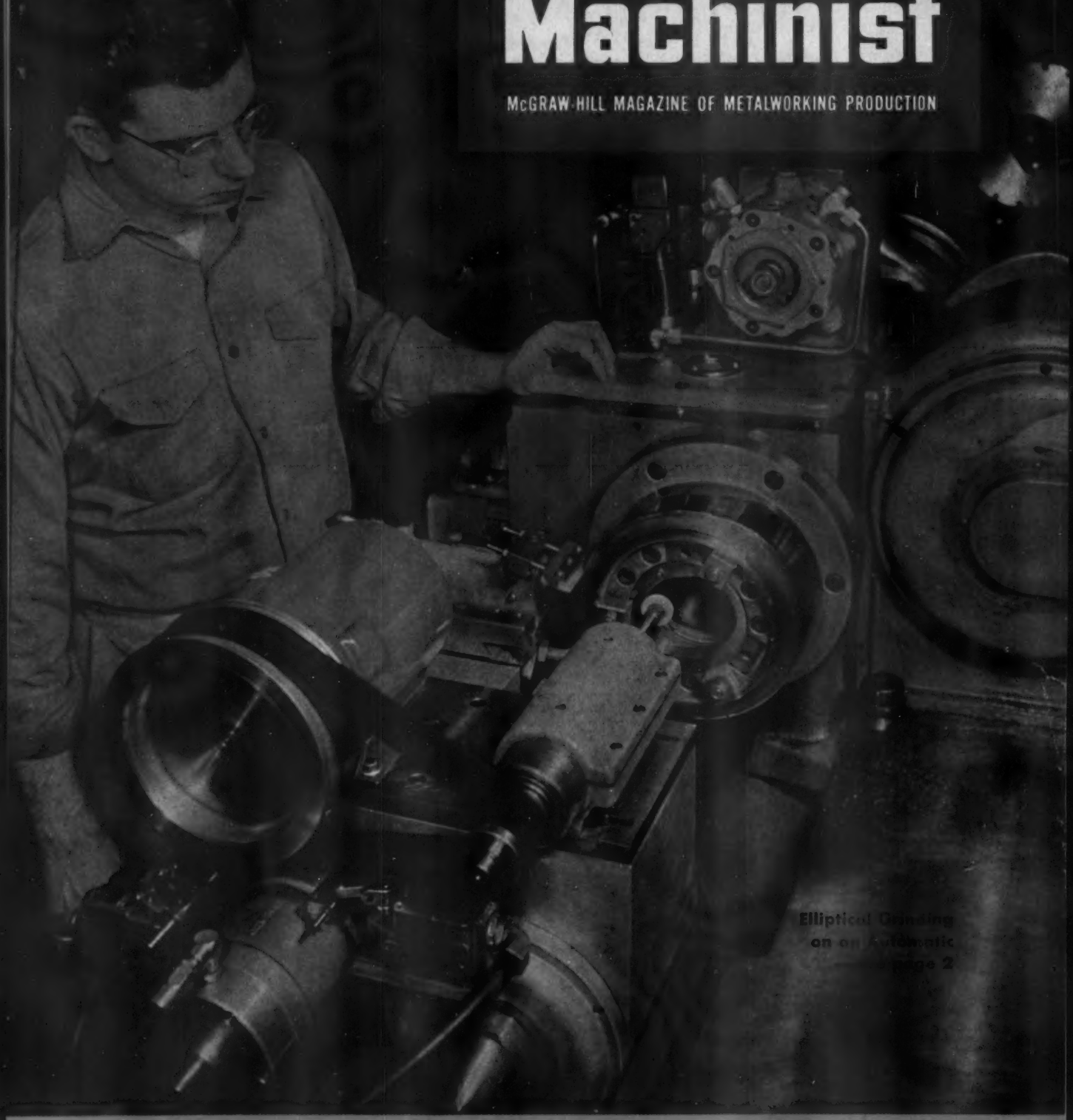
PRICE 50 CENTS

DECEMBER 5, 1955

# American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Elliptical Grinding on an Automatic
Page 2

## HOW TO PREDICT MANUFACTURING COSTS

## SCRAP-STRIP LAYOUT—starting a series

# IT "THINKS" FOR ITSELF!

new

## HEALD MODEL 170 AUTOMATIC CHUCKER

with after-gaging and **FEEDBACK**
holds close size limits automatically

### WHAT FEEDBACK MEANS TO YOU

The practical application of feedback to internal grinding and borizing equipment opens a new field for cutting production costs on long-run jobs.

A signal from the after-gaging unit is fed back to the tooling or diamond — automatically correcting any tendency to drift out of size. Feedback limits are well within specified tolerances of the work, thus making any needed corrections *before* parts reach scrap limits.

All this is done without any effort or attention on the part of the operator. That means higher productivity per man-hour — one operator can easily control a greater number of machines. It means that off-size scrap parts are virtually eliminated. It means higher sustained production, with greater accuracy and precision, at *lower cost per part.*

The new, completely automated Heald Model 170 Auto Chucking Size-Matic shown above makes short work of grinding a blind interrupted bore in valve tappet bodies.

With *automatic* hopper feed, orientation, chucking, cycling and unloading, a net production of 204 pieces per hour at 90% efficiency is consistently maintained. And with after-gaging and feedback, tolerances of .0003 on bore size, .00005 maximum out-of-roundness and .0001 maximum taper are easily held. Feedback enables the machine to detect tendencies toward errors—and correct them automatically, without operator attention.

This is Heald automation at work—bringing you higher production and greater precision than ever before. For the newest advances in internal grinding, rotary surface grinding and borizing — IT PAYS TO COME TO HEALD.

***For information on the new 170 Size-Matic, send for Bulletin 2-170-A.***

**THE HEALD MACHINE COMPANY**
Subsidiary of The Cincinnati Milling Machine Co.
**Worcester 6, Massachusetts**
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

HEALD

UT—starting a series


# American Machinist

MAGAZINE OF METALWORKING PRODUCTION



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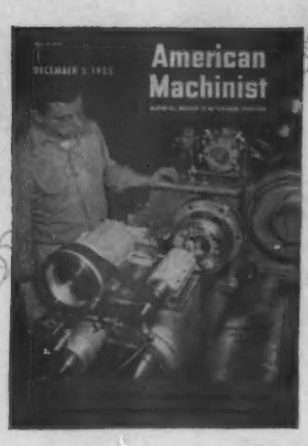



# chips

**CONTOUR GRINDING** . . . Our cover shows one of two Gisholt No. 12 automatic production lathes tooled for finish boring and grinding the contoured ID of hydraulic-pump stator cams for South Water Machinery Co, Rockford, Ill. We show the grinding operation, done at 40-rpm workpiece speed and 50,000-rpm wheel speed. Two different workpiece sizes are handled. A large parabolic cam on the OD of the machine spindle controls oscillation of the carriage. For details, see the article in this issue by E Svenson.

**COST PREDICTION** . . . Step-by-step procedure for planning production of a new product, plus cost analysis, is something almost every reader needs. Reno R Cole, manager of Methods & Standards and chief metallurgist of Friden Calculating Machine Co, gives it to you in our lead article.

**DIE LAYOUT** . . . You will recall our fold-out insert on die design (*AM*— Oct. 10). Now J R Paquin comes back with a series of detailed explanations, step by step. The first step—scrap-strip layout—is in this issue. Watch for the others in succeeding issues.

**TOOLING** . . . Three articles deal directly with various aspects of tooling. . . . Roy A Tassi and Robert Easton of Westinghouse-Sunnyvale explain how to form-mill molybdenum. It is hard *and* abrasive, requires rigidity and special tooling. . . . E Svenson describes an automatic lathe tooled for contour grinding. . . . And there's a spread of Talented Tooling, such as an indexing table under a draw-cut shaper, offset cutter heads on a screw machine, sectional dies, and an automated broach.

**OPERATION BOOTSTRAP** . . . That's what Greist Mfg Co, New Haven, Conn, set out to do in 1947. The management, led by Merritt D Vanderbilt, president, and Hubert M Greist, exec vice-pres (see biog), decided to cut loose from old methods and limited objectives. They built and equipped an ultramodern plant, do 10 times the output with only 4 times as many men as pre-war.

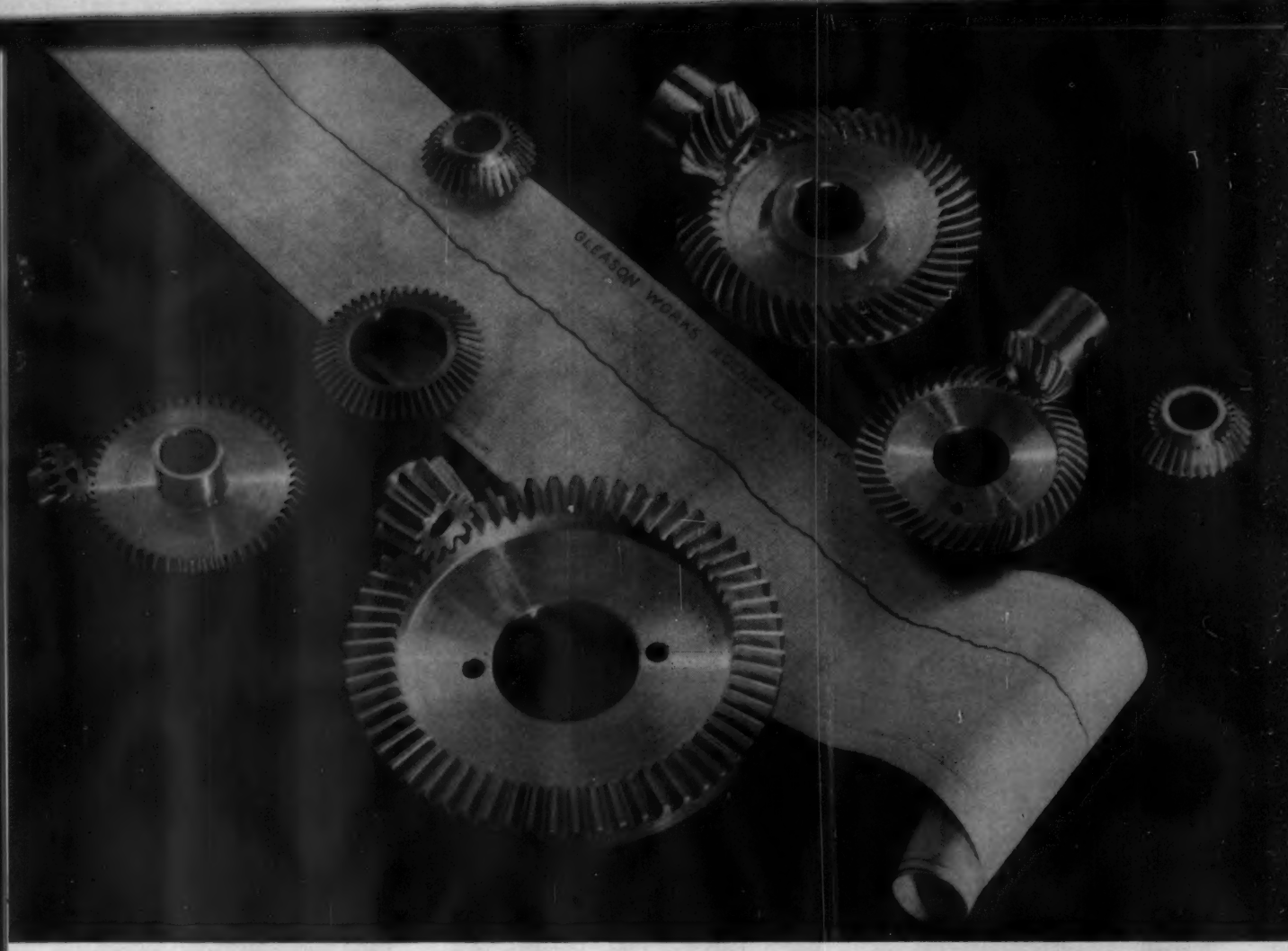
**WELDING** . . . Arc welding is being done with $CO_2$ as the atmosphere. We bring you a case study from GE-Bloomfield showing seal welds on a packaged air conditioner. Here are data on techniques, advantages, problems.

**WET OR DRY?** . . . Should carbides be ground wet or dry? John Ripple of Carborundum gives authoritative information on which one where. It all depends on the wheel and the machine, says he.

**RED AUTOMATION** . . . How far have Soviet engineers gone with continuous flow production? The answers are in two quick pages.

**COMING** . . . *AM* for Dec 19 will have an appropriate Christmas cover, a Special Report on surface examination, articles on vacuum metallizing, high-efficiency machining, flame hardening, deep-hole drilling, and contouring shroud rings.

**MERRITT D VANDERBILT** (right) is a New Yorker born who worked his way up on the accounting side (except for a sergeancy in WW I and a year as a revenue agent). He became president of Greist Mfg Co, New Haven, in 1942, is a director of a number of companies. **Hubert M Greist** (left) has his BS in Industrial Engrg from Yale ('34) and has taken several management and quality-control advanced courses. He has worked in all departments of Greist, during and after his school years, was in the Navy from '43-'47, leaving as a full commander. He became vp and general mgr of Greist in 1948, exec vp in 1954, and of Air Marine Motors, Inc, in 1955. These two men are responsible for the tremendous changes at Greist Mfg detailed in our Special Report.




# For *the best* in fine pitch gearing . . .

Gleason Works now offers complete production and testing facilities for *any* fine pitch spiral bevel, hypoid, Zerol® or Coniflex® gears.

Bevel gears produced and tested with Gleason equipment assure the highest degree of accuracy obtainable in angular motion transmission. And, with the new methods and improved design incorporated in these Gleason machines, fine pitch gears can be produced at a lower cost than ever before!

### Generators and grinders

Three Gleason Generators cover the entire field of cut fine pitch bevel gears up to 4½" diameter. These include the No. 2A, 103 Straight Bevel Coniflex Generators, and the No. 2 Hypoid Generator. All three are automatic machines for jobbing or high-speed production and will improve quality besides increasing production.

For the ultimate in durability and accuracy, hardened fine pitch bevel gears are ground in the No. 105 Straight Bevel Coniflex Grinder or the No. 7 Hypoid Grinder. These Grinders are completely automatic wet-type, high-speed machines.

In gear manufacturing, testing is just as important as the actual gear cutting or grinding. One Gleason Tester—the No. 104 Hypoid Tester—checks the running qualities, tooth spacing and concentricity of gears up to 4¼" diameter.

An important new feature of the No. 104 is the provision for recording the rolling test on paper, giving a permanent record of tooth to tooth composite error. An electronic pickup head for a recorder is furnished, and the recorder itself may be engaged or disengaged, as required.

### Engineering services available

Cutter sharpeners and complete tooling are available to suit your requirements. In addition, the services of the Gleason Engineering Department are at your disposal, at no obligation to determine the best fine pitch gears for your application and the machinery required to produce them. Write for further information.

**GLEASON WORKS**

*Builders of bevel gear machinery for over 90 years*

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

# Change "Can't" to "Can Do" with job-designed CINCINNATI

**Independent Overhead Spindle** . . . greatly increases versatility and cutting range of knee-type milling machines. Completely self-contained; replaces the standard Cincinnati overarm, and can be purchased at any time. Single swivel or double swivel spindle heads available. Eight spindle speeds, selected with dial on pendant control. No. 50 series spindle nose; 3 hp or 5 hp drive.

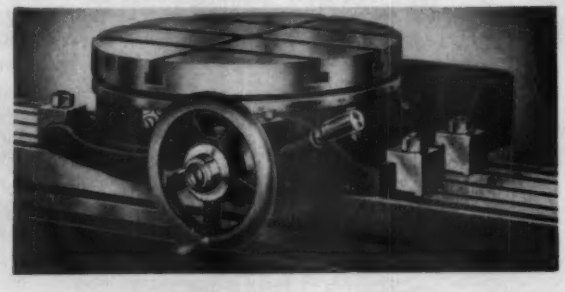
**Vertical Milling Attachment** . . . for vertical milling operations with large end mills and face mills. Spindle speed ratio ⅔ to 1 or 1 to 1. No. 50 spindle nose; anti-friction drive. Catalog Nos. M-1766 and M-1717-1.

**High Speed Universal Milling Attachment** . . . for vertical and angular milling operations with small cutters. Spindle speed ratio greater than 1 to 1, depending upon your machine. Catalog No. M-1846.

**Universal Spiral Milling Attachment** . . . for milling helical gears as well as for miscellaneous milling operations. Spindle speed ratio ⅔ to 1 or 1 to 1. Catalog No. M-1718-1.

**Slotting Attachment** . . . for keyway cutting, die and tool work where slotter is not available. Stroke adjustable from 0 to 4". One set of slotting tools included. Catalog No. M-919-1.

**Quick Change Adapter, Arbors, Collets** . . . reduce time for changing cutters to 20 seconds or less. Desirable for multiple operation setups. Available for Nos. 40 and 50 spindle noses. Catalog No. M-985.



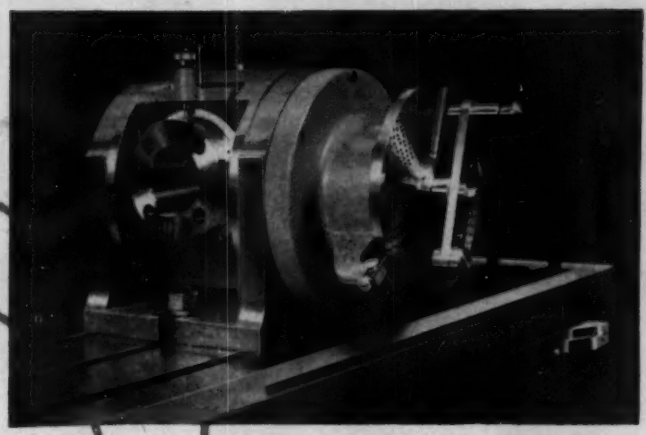
**Circular Milling Attachments** . . . for continuous production milling or operations requiring rotary feed . . . 12", 16", 20" and 24" diameter tables, with standard T-slots. Table is graduated in degrees. Power or hand feed. Machine drives the power feed units at both feed rate and rapid traverse rate. Catalog No. M-1660-2.

# ATTACHMENTS

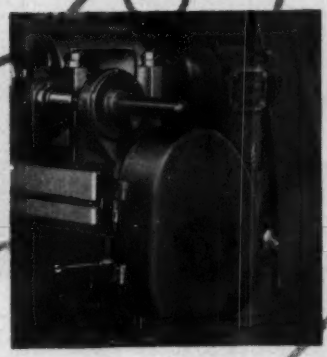
## on your CINCINNATI MILLING MACHINES

Are you faced with new machining operations or production requirements for present shop equipment? Perhaps you can find a quick solution in job-designed attachments for your Cincinnati Milling Machines. Eleven of them are illustrated here. Just glance at the illustrations, and you'll see how some of these Cincinnati Milling Attachments increase versatility, some increase production and others improve accuracy. Chances are, you will find just the right attachment for your requirements. Complete catalog information available from our nearest agent or direct office; or write to:

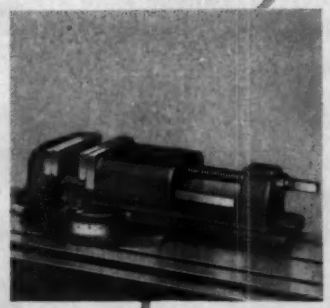
**THE CINCINNATI MILLING MACHINE CO.**
**CINCINNATI 9, OHIO**



**Dividing Head** . . . for milling any work requiring accurate spacing on arc of circle, such as spur and helical gears, taper reamers, clutches, spline shafts, constant rise cams, etc. Indexes all numbers up to 60, many others up to 1000. Three sizes available: 10", 12" and 14". Features include precision anti-friction mounting for spindle; standard No. 50 series taper hole in spindle; quick disengagement of worm for direct indexing. Catalog No. M-1924.



**Enclosed Driving Mechanism for Dividing Head** . . . for milling spiral or helical gear teeth, driven cams and similar shapes. May be used with Dividing Head or Spiral Milling Head. Catalog No. M-1755.



**Vises** . . . Plain, Swivel (illustrated), Toolmaker's, and All-Steel. For milling, drilling and shaping operations. Catalog for each type. Nos. 3 and 5 plain and swivel vises, 4" and 7" jaw openings, respectively.

**Index Base** . . . for production milling. Duplicate or progressive fixtures at each end of index base, loaded during cutting cycle. Pivots 180 degrees. Five sizes: 12" x 24" to 20" x 36". Catalog No. M-1448-2.

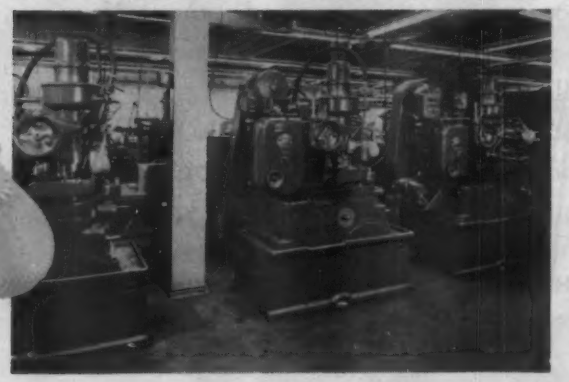
# CINCINNATI

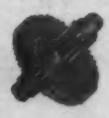
**MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES**
**OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID**

# Where .0002" FELLOWS



Battery of Fellows 3" Gear Shapers (above) and 7-Type Gear Shapers (below) are daily turning out gears to .0002" tolerances in the Norden-Ketay shop.





THE PRECISION LINE

# tolerances are routine...

# is *standard* equipment!

Bomb director systems! Computers! Fire Control systems! Aircraft engine and flight control instruments! These are some of the products designed and manufactured by the Instrument and Systems Division, Norden-Ketay Corporation!

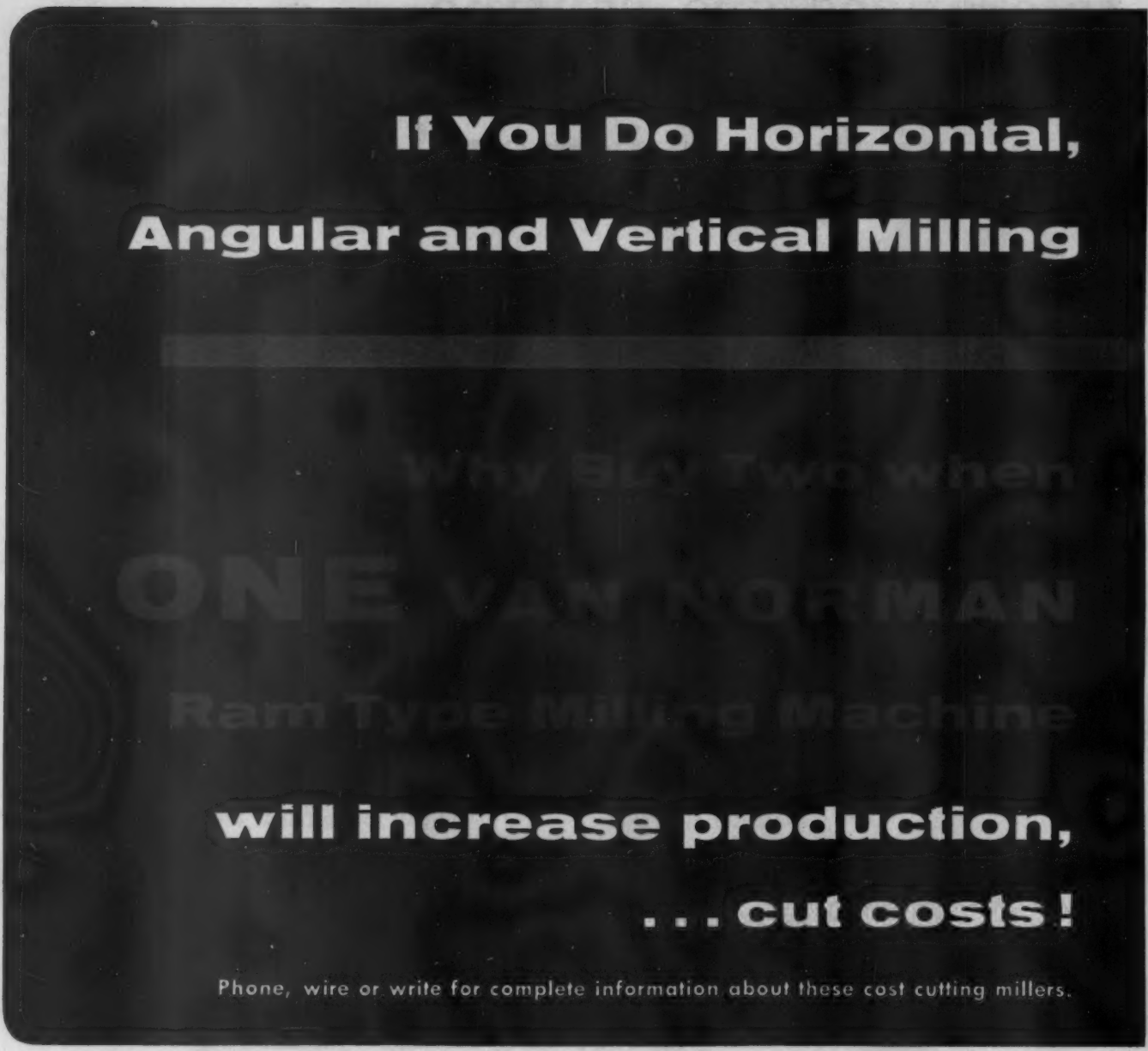
At the heart of these electro-mechanical devices are gears and gear trains which must have runout tolerances within .0002". To produce these high-precision gears Norden-Ketay relies upon Fellows Gear Production Equipment.

Fellows fully integrated line of machine tools assures absolute control over quality, as well as costs, wherever fine-pitch gears must be made to rigid specifications. In addition, they incorporate many modern features that not only permit much faster feeds and speeds, but also hold set-up time and change-over periods to a minimum.

If you are manufacturing fine-pitch gears, it will pay you to follow the example of other leaders in the industry, and consult with your Fellows representative. He will gladly provide all the technical data you desire, and where requested, give complete information about the Fellows Plan for deferred payment.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1 • 6214 West Manchester Avenue, Los Angeles 45

**Fellows** *Gear Production Equipment*

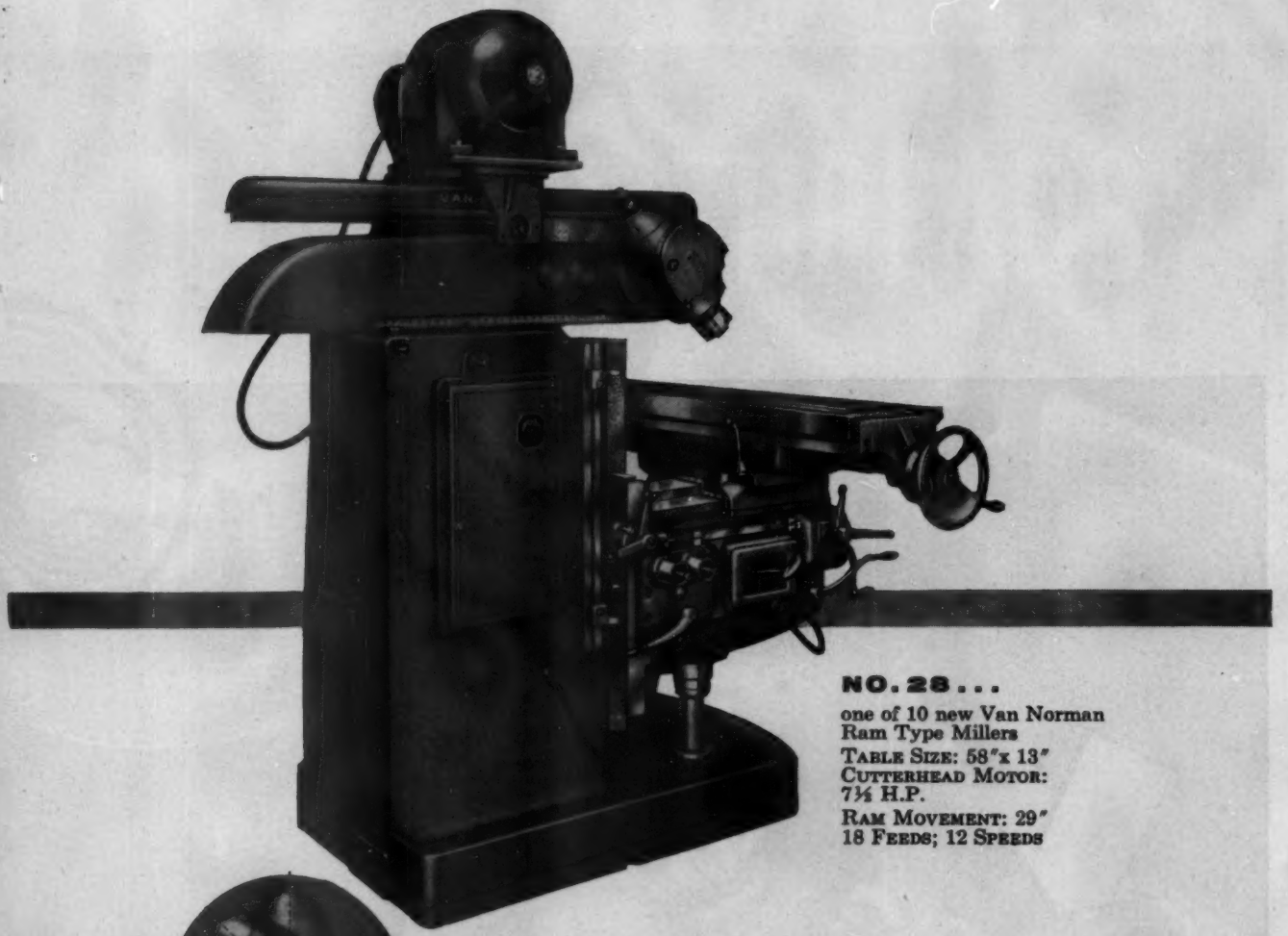

If You Do Horizontal,
Angular and Vertical Milling
Why BUY Two when
ONE VAN NORMAN
Ram Type Milling Machine
will increase production,
. . . cut costs!
Phone, wire or write for complete information about these cost cutting millers.

*Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.*

*Lease and Conditional Sales Contracts not available to Export*

# VAN NORMAN

**MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.**

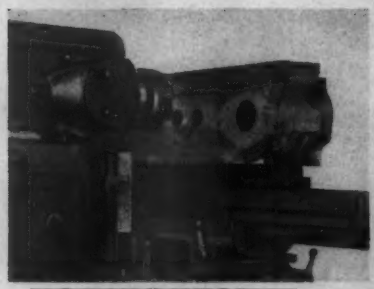


**NO. 28...**

one of 10 new Van Norman Ram Type Millers

TABLE SIZE: 58″ x 13″
CUTTERHEAD MOTOR: 7½ H.P.
RAM MOVEMENT: 29″
18 FEEDS; 12 SPEEDS

**THE ADJUSTABLE CUTTERHEAD PERMITS HORIZONTAL, VERTICAL OR ANGULAR MILLING ON ONE VAN NORMAN MILLER.**

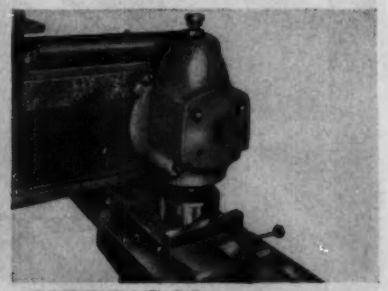


**HORIZONTAL...**

A heavy horizontal milling cut performed on a milling machine ram. The rigidity of machine prevents chatter. Material cast iron; Cutter 8″ Carbide Face Mill; Speed 189 rpm; Feed 15 ipm; Depth of cut 1/16″; Width up to 7″.

**ANGULAR...**

An angular milling operation is being performed on a workpiece. Angular range of cutterhead is 0 degrees to 90 degrees. Accurate positioning is simplified by easy-to-read graduations.

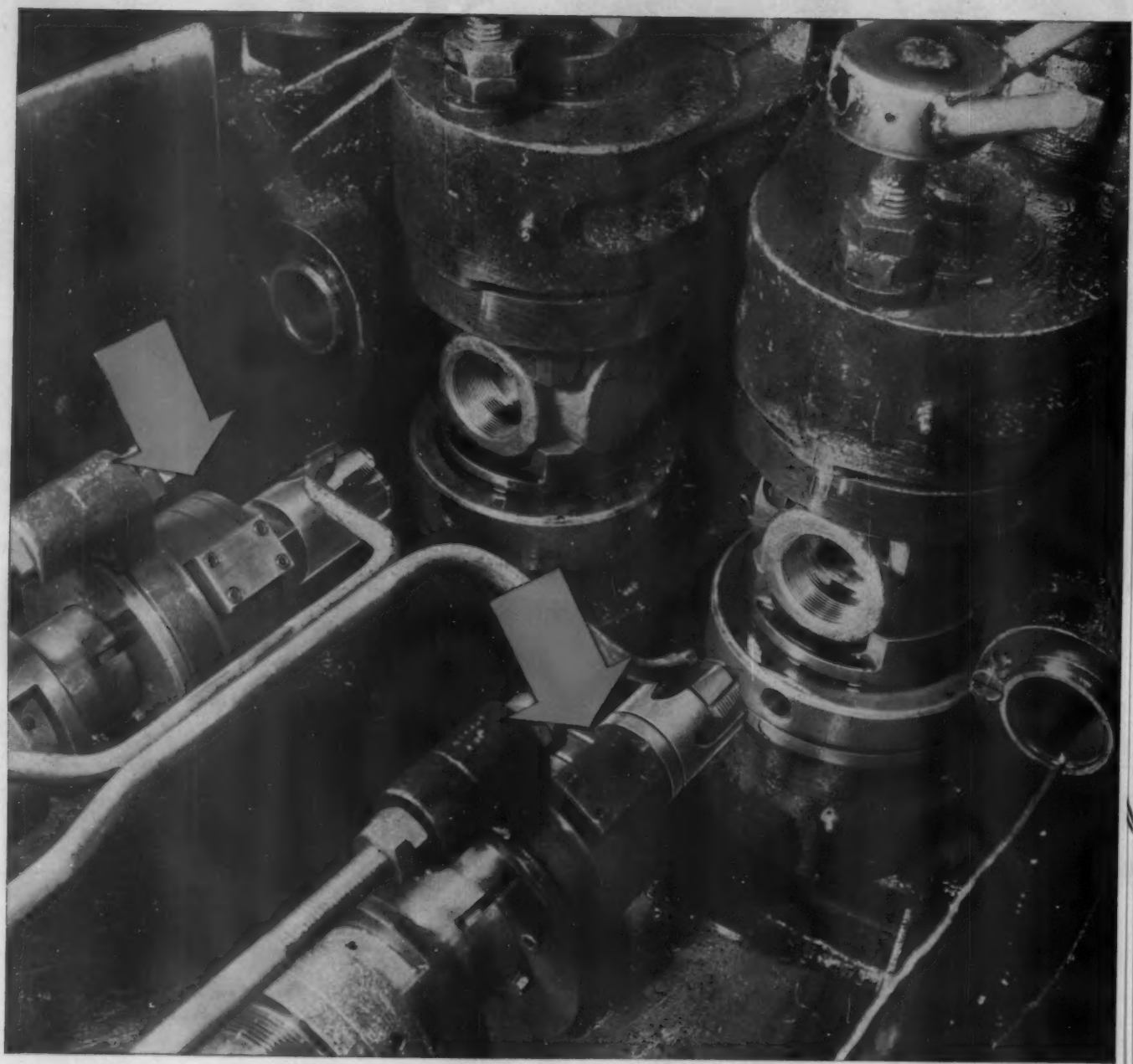


**VERTICAL...**

With Cutterhead in vertical position, cast iron saddle body is milled with a 6″ Carbide Face Mill. A heavy finish cut is made. Speed 267 rpm; Feed 14½ ipm; Depth of cut ¼″.

# COMPANY

SPRINGFIELD 7, MASSACHUSETTS



# TAPERED THREADS

## produced with *LOW* Tool Cost

## by receding *TAP*

"Receding action" enables the LANDIS LL Tap to thread 4000 W-S pipe fittings per grind at production rates to close tolerances.

This action produces a tapered thread of great accuracy because it mechanically withdraws the chasers from the work at a rate equal to the taper of the thread being produced. Cutting strains are reduced, a true conical thread produced, thread finish improved, and chaser life lengthened.

W-S pipe fittings are produced by the Watson-Stillman Fittings Division of the H. K. Porter Co., Inc. (Roselle, N.J.) for high pressure pipe lines. In the particular operation illustrated, two LANDIS LL Rotary Taps on a special drilling and tapping machine are threading Forged Steel Pipe Elbows. 2" 11½ pitch ASTP threads are tapped at 35 s.f.m.—with 4000 threads completed between chaser grinds.

The LL Tap is also well-suited for threading Stainless Steel. Its cutting action is limited to the throat section or chamfer of the chaser, tapping the thread quickly with little cold-working. As on all LANDIS Taps, detachable heads allow each size of Tap Body to produce a wide range of thread diameters.

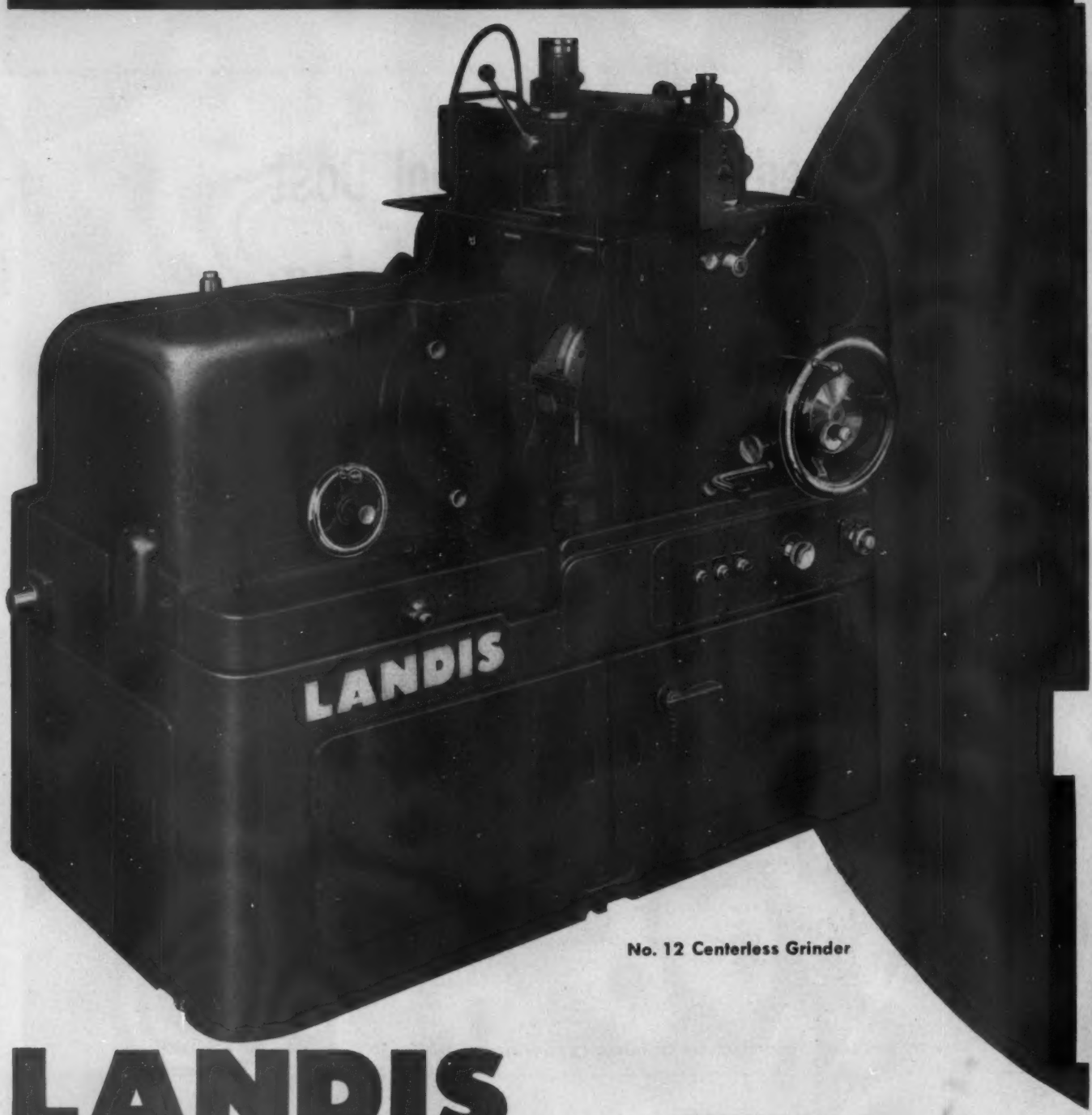
For further information, send specifications and ask for Bulletin G-95.

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

**LANDIS *Machine* COMPANY**

WAYNESBORO • PENNSYLVANIA • U.S.A.

# Landis centerless grinder permits without loss of




No. 12 Centerless Grinder

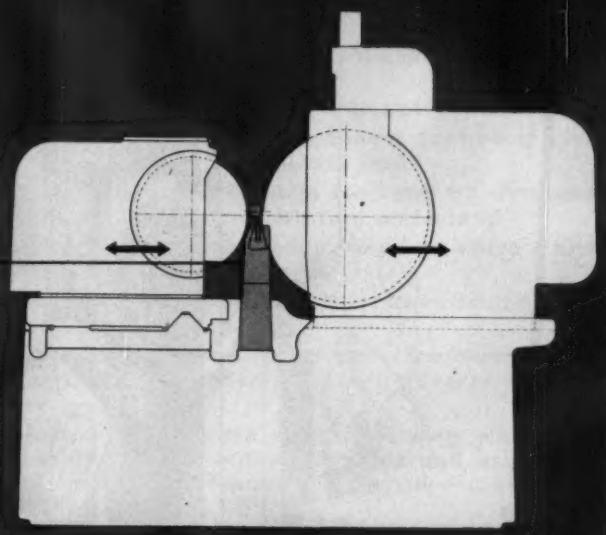
# LANDIS

precision grinders

# heavy cuts accuracy or finish

**Exclusive Landis method of centerless grinding:**

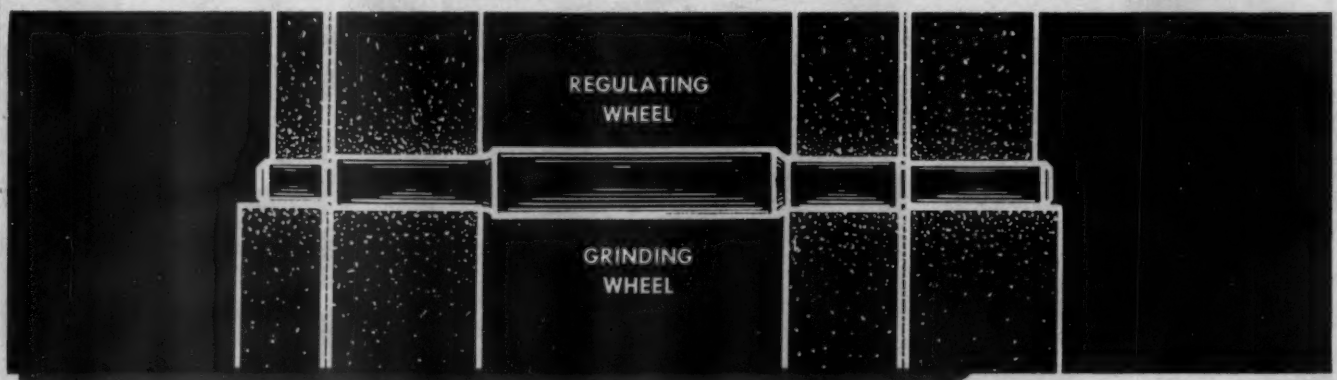
Work rest remains stationary . . . grinding and regulating wheel heads move on hand-scraped ways.



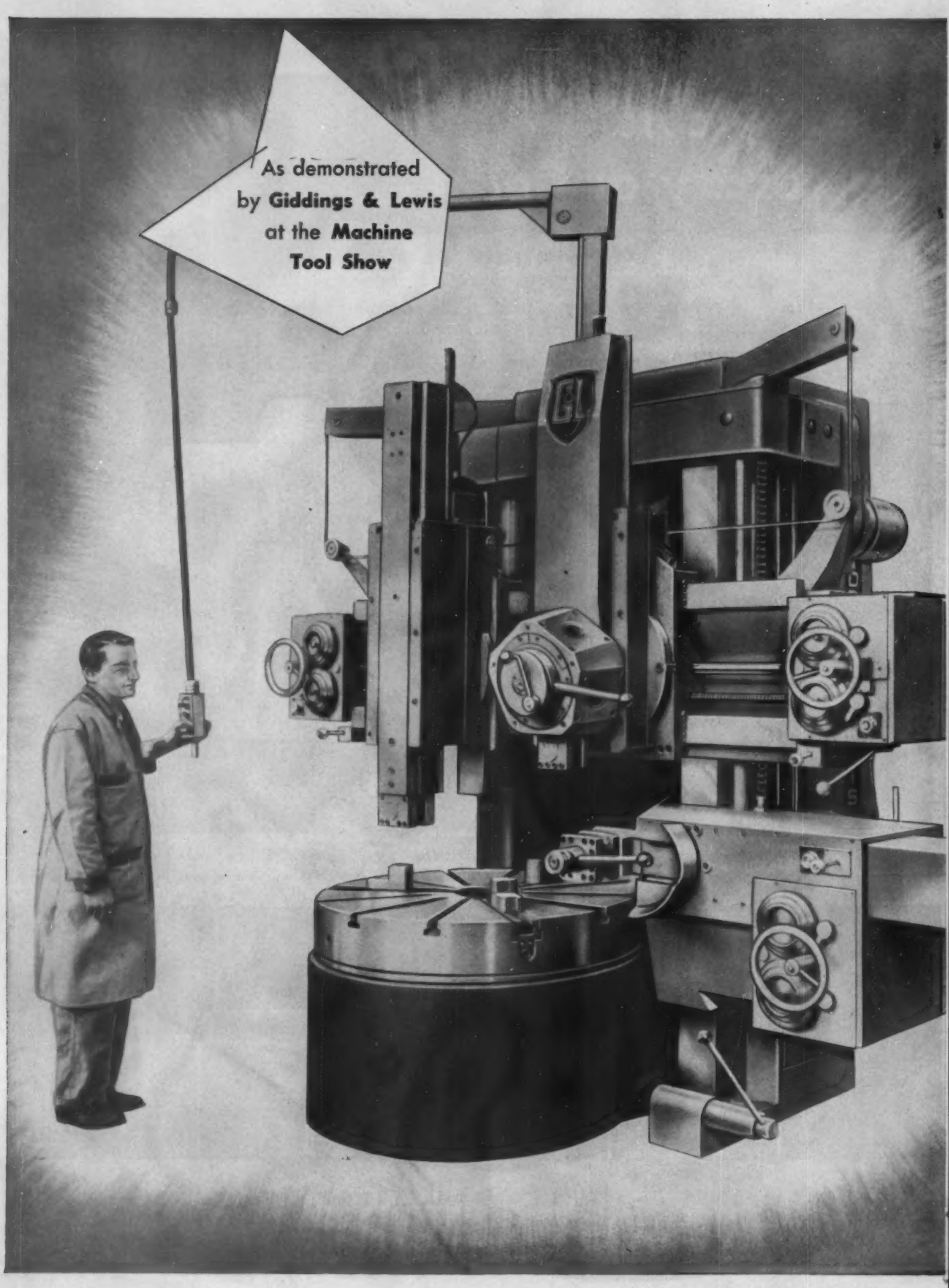
Rigid, bed-mounted stationary work rest for maximum support

**. . . gives results like this:**

Finish grinding four diameters in one operation. Production is 380 shafts per hour. Stock removal .003". Work uniformity improved from .0007" to .0003" over former method. Cuts grinding and inspection costs.



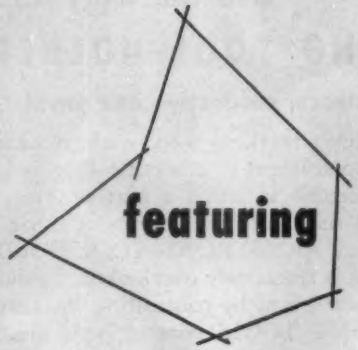

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.


As demonstrated
by Giddings & Lewis
at the Machine
Tool Show

# A Most Versatile Vertical

## the ALL NEW Giddings & Lewis

# 42" Vertical Turret Lathe




- ✓ **"joy stick" directional control and instant powered remote-control shift**
- ✓ **ability of machine to change table speeds in-the-cut or on-the-fly**
- ✓ **feed box with two working ranges of 16 feeds each**
- ✓ **constant cutting speed attachment (optional) giving 16 direct feet per minute rates**
- ✓ **each head with independent feed and traverse and directional controls to both ram and saddle**
- ✓ **several types of ram heads (fixed or swivel) and various table arrangements**
- ✓ **special attachments (optional) for thread cutting and geared taper turning**
- ✓ **swiveling turret and ram heads counterbalanced for easy motion under feed and traverse and for swiveling**
- ✓ **jet-lubrication to main spindle bearing with main motor drive. All machine elements and associated feed units are automatically pressure lubricated when in motion.**

HERE'S the Giddings & Lewis highly-versatile, new 42" Vertical Turret Lathe. And if you saw this machine in action at the Machine Tool Show, you'll agree that its revolutionary new design features are the latest — never before offered on any other Vertical Turret Lathe.

Listed above are only a few of the many outstanding features you get—improvements that permit high-speed, multiple machining operations in a single setup. For example, the centralized controls with standard coaxial micrometer dials and circular scales and "joy stick" directional control of feed and traverse, assure you greater accuracy at high speeds, simplicity of operation and reduced operator fatigue.

This all new G&L machine offers you even greater versatility with its choice of various standard heads — available as swiveling turret (five-station) or swiveling ram rail heads and side head. These specially-designed heads can be used in any combination for rough and finish machining of small or large workpieces.

Another important, versatile feature includes standard table arrangements — available in plain, three- or four-jaw combination or powered chucks. Powered by a 50-hp motor drive, the table provides variable speeds from 6 to 320 rpm in 24 geometric steps in two ranges and feeds between .0007" and .576" in 20 geometric steps. What's more, the operator can change table speeds in fly or on cut — saving machining time and extending tool life.

For more information on the outstanding features of Giddings & Lewis new 42" Vertical Turret Lathe, be sure to see your nearest G&L representative. He'll be glad to give you all the details and tell you what this versatile, economical machine can do for you.

**GIDDINGS & LEWIS MACHINE TOOL CO.**

FOND DU LAC, WISCONSIN

*Builders of the world's finest heavy-duty machine tools — Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; Upright and Radial Drilling Machines; and Davis Boring and Cutting Tools.*

# ARMSTRONG

## Use the Correct...

## ARMSTRONG TOOL HOLDERS

**to increase pieces, production and profits!**

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the new additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMOLOY (Cast Alloy) Bits and Blades; the new "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

## ARMSTRONG BROS. TOOL CO.

*"THE TOOL HOLDER PEOPLE"*

**5215 W. ARMSTRONG AVE** **CHICAGO 30, ILL.**

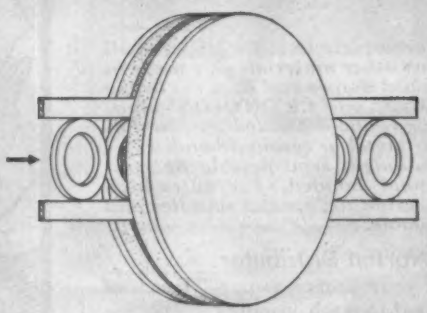
# Two grade disc cuts grinding cost

## 35% more production / longer disc life

**WORKPIECE**
Cast Iron Rings

**FORMER PRODUCTION**
Smooth faced discs had to be replaced after grinding 21,500 rings.

**PRODUCTION WITH GARDNER 2 GRADE DISCS**
raised to 29,000 rings.



**GARDNER WIRE-LOKT®** Abrasive Discs
30″ x 2″ x 3½″ with corrugated face

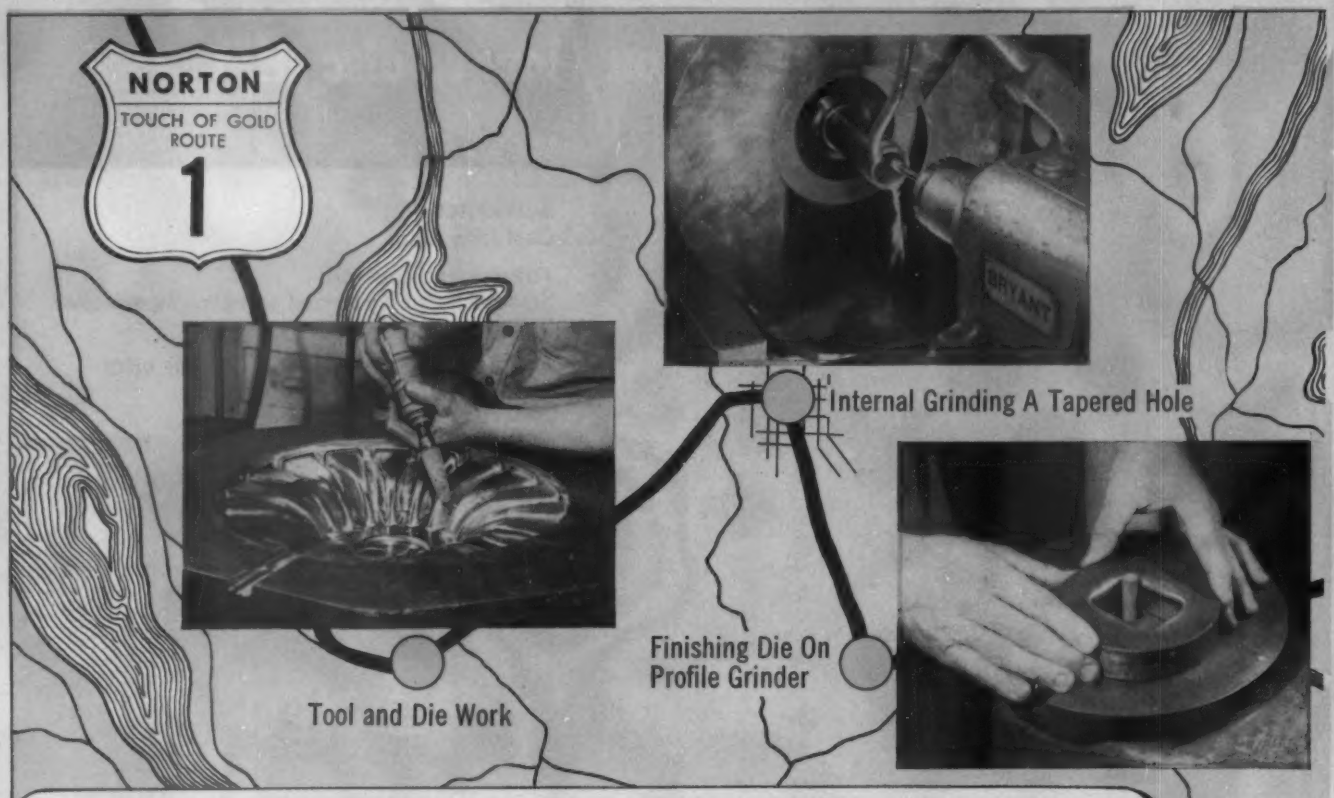
**INNER GRADE—SOFT** for maintaining flat face on discs

**OUTER GRADE—HARD** for shear cut and to resist "bell mouthing"

GARDNER

abrasive discs

BELOIT, WISCONSIN




# YOUR "TOUCH of GOLD" ROAD MAP TO HARD-TO-REACH GRINDING SPOTS

## NORTON MOUNTED WHEELS AND POINTS

*bring you big savings on hundreds of small grinding jobs*

Norton mounted wheels and points bring the same "Touch of Gold" grinding performance to small or hard-to-get-at areas that the big Norton wheels deliver in the "wide open spaces." Which means that every time you put one to work you get better grinding for less money. Here are some reasons why:

- ***Norton mounted wheels and points stay on their spindles — stay on TIGHT, under severest use. Norton-developed mounting techniques make sure of this.***
- ***They're trued on their own spindles, which assures: (1) perfect concentricity; (2) sharpness and fast-cutting action; (3) accuracy of dimensions and shape. They're ready to go to work immediately.***
- ***They're duplicated identically from lot to lot, thanks to Norton's statistical quality control in processing.***
- ***They're a 100% complete line, for grinding all metals and many other materials . . . made in nearly 200 standard shapes and sizes . . . in the famous ALUNDUM* and CRYSTOLON* abrasives, vitrified or resinoid bonded . . . in diamond abrasives, metal or resinoid bonded . . . and in the laminated, semi-flexible BF construction, resinoid bonded. For ultra-high speed precision grinding, special spindles and cement are available.***

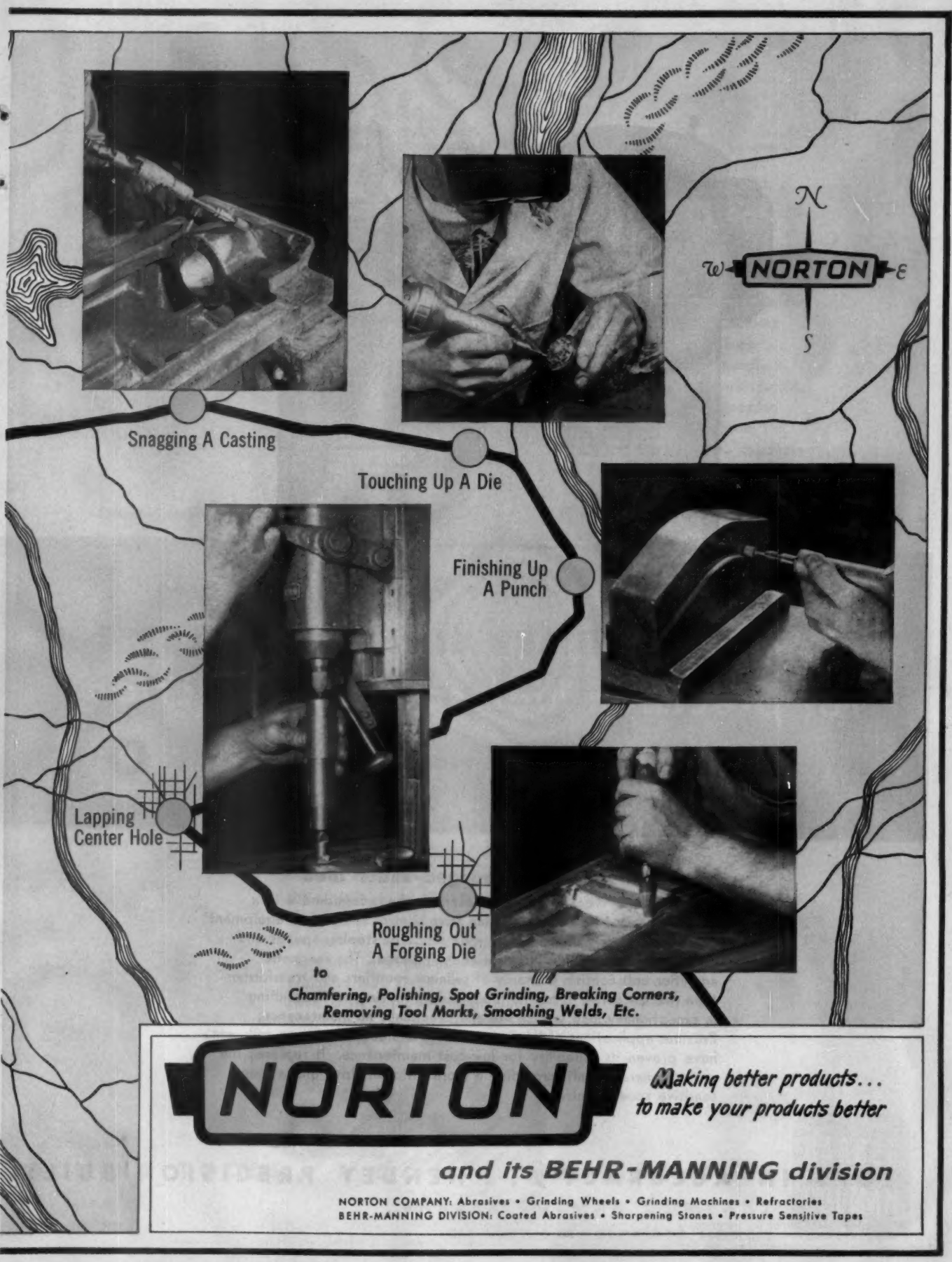
### Your Norton Distributor

can help you plan your profit-boosting "Touch of Gold" Route to hard-to-reach grinding spots. See him for the mounted wheels and points you need. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1648

BELOIT, WISCONSIN

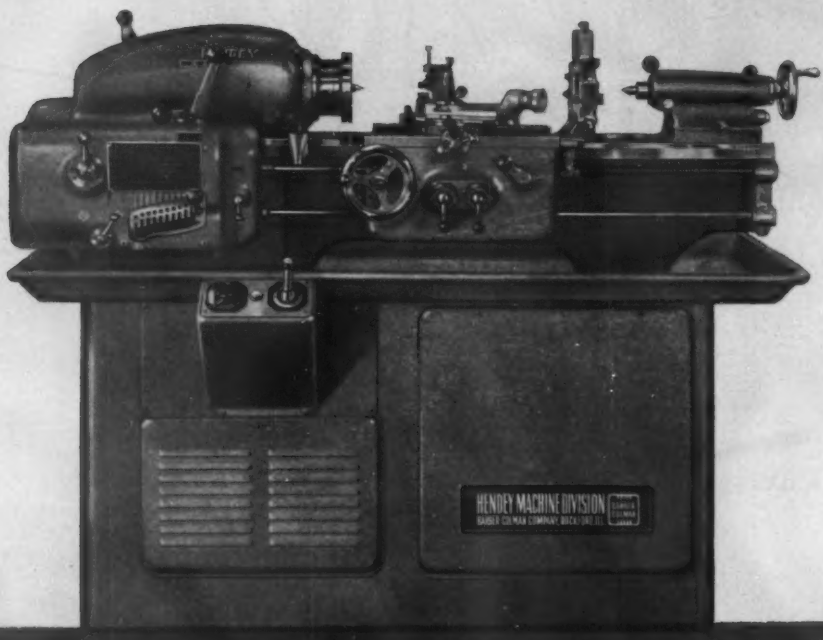



**NORTON**

*Making better products... to make your products better*

***and its BEHR-MANNING division***

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes




# Hendey TOOL AND GAGE-MAKERS LATHE

## for precision high speed production

NEW MAGNETIC AMPLIFIER DRIVE UNIT PROVIDES INFINITELY VARIABLE SPEEDS

**smoothly and easily changed under load**

The Hendey 9" Tool and Gage-Makers Lathe is furnished with a completely new magnetic amplifier drive control as standard equipment. This speed control unit allows a wide range of stepless speeds and a close control of speed under a changing load. The magnetic amplifier unit consists primarily of selinium rectifiers and transformer-type reactor cores. It has no tubes and no moving parts, resulting in exceptionally long service life and practically no maintenance. Previous applications of this type of drive in steel mills, paper mills, etc., have proven its reliability for low-cost maintenance. It replaces the motor-generator unit, providing a more efficient drive and a more sensitive speed control.

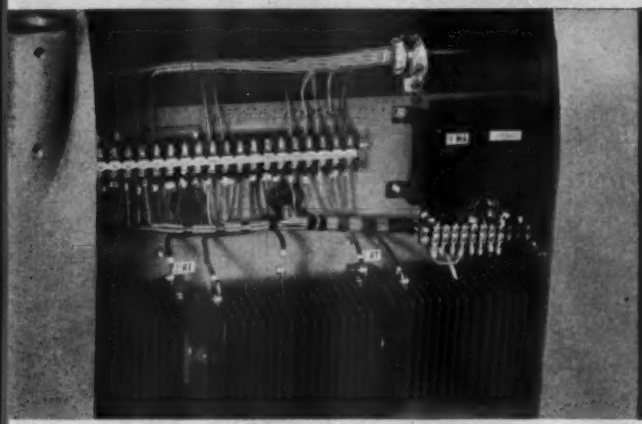
**TOPS IN ACCURACY . . . HENDEY PRECISION-BUILT**

The range of spindle speeds is from 15 RPM to 3000 RPM. No gears are engaged when operating in the belt speed range of 25 RPM to 3000 RPM. The drive from the motor to the spindle is through a multiple V-belt drive. The AC source of power is converted to DC by means of the magnetic amplifier unit.

## simplified controls

The speed control knob and dial and the Start-Stop and Reverse handle are conveniently located at the operator's left hand. After selecting the desired belt or back gear speed range, simply turn the knob to the required speed as shown on the dial. The control handle is turned for selecting forward or reverse operation of the work spindle. The handle is then pulled for starting, and depressed for stopping the drive motor. The knob and handle control the spindle speed, the direction of spindle rotation, and starting and stopping the machine.

Section of Magnetic Amplifier Unit



Speed Control Knob and Dial

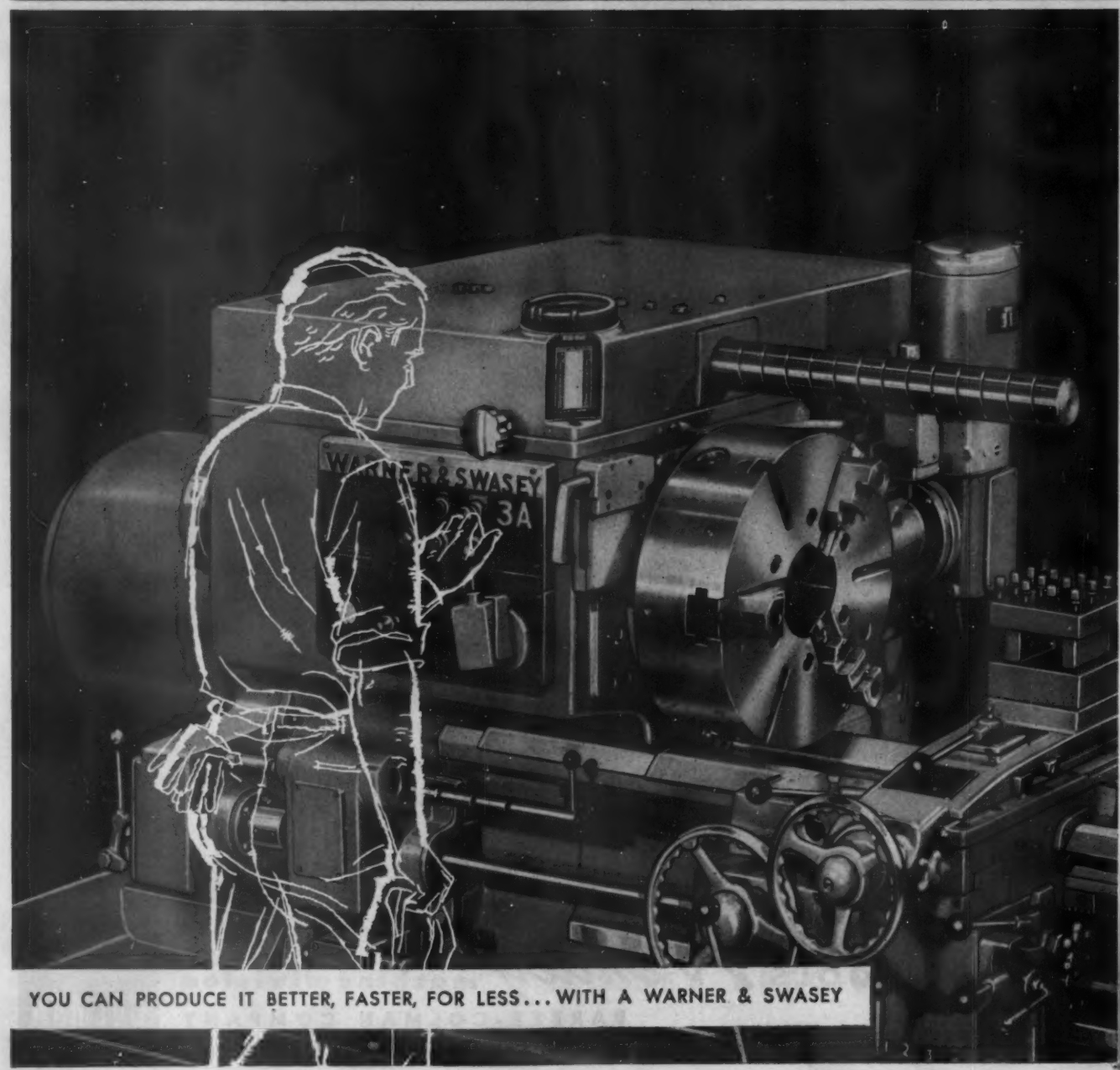
## other features

Other features of the Hendey 9" Lathe include:
66 quick-change thread cutting and feed changes
Pre-loaded, super-precision, anti-friction spindle bearings
Hardened and ground bed ways
Precision lead screw
Feed shaft independent of lead screw
10¼" swing over ways — 24" centerdistance

MACHINE TOOLS *Hendey* machine division
BARBER-COLMAN COMPANY
211 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

# BIG...POWERFUL...ACCURATE AND YET SO EASY



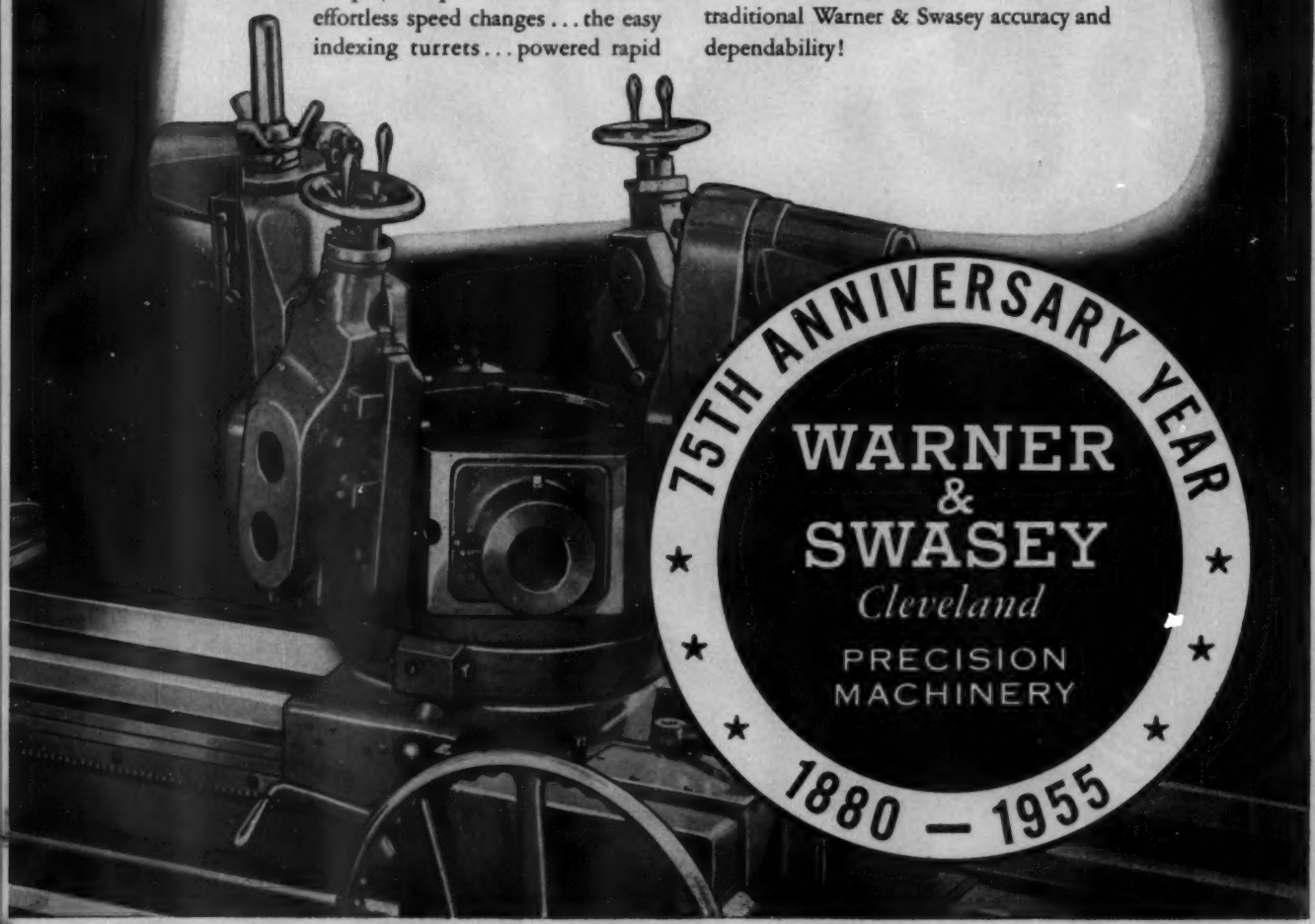

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

# ...VERSATILE...
# TO OPERATE!

WARNER & SWASEY turret lathes have become more powerful, more versatile, more accurate, more productive—and yet much *easier* to operate.

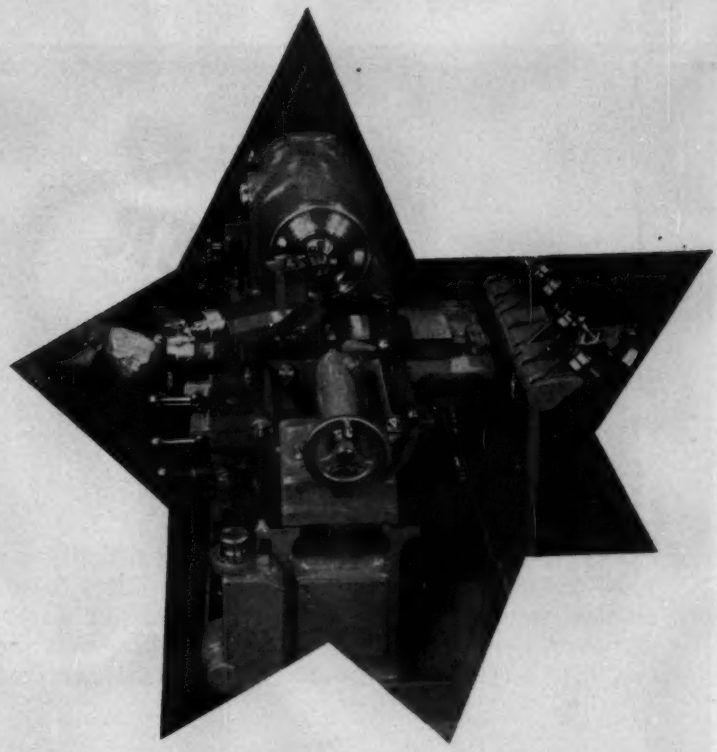
Operators of the new extra-heavy duty saddle types like, for example, such Warner & Swasey advantages as the ease of spindle speed selection... the effortless speed changes... the easy indexing turrets... powered rapid traverses... zoned operating controls throughout... the high-speed hydraulic bar feed with adjustable feed-out... and bed design that permits them to stand closer and more comfortably to the work.

And, like all Warner & Swaseys, this new line of saddle type turret lathes give you traditional Warner & Swasey accuracy and dependability!



Click—
and you've
made a
tool change!

# Pre-Ground, Pre-Calibrated Monarch *QUIK-TOOL* Ready-Set Tooling Provides Immediate Tool Change



Tool block fits any standard Monarch 10" Model EE Toolmaker's or Manufacturing Lathe compound rest "T" slot. Tools can be used in any combination or sequence for turning, boring, facing, chamfering, grooving, necking, threading, knurling, or cut-off. The tools automatically position themselves.

What's Quik-Tool? It's a tool block and set of seven tool holders, all precision ground and pre-calibrated to provide better accuracy of positioning and response than you get from any turret.

And it's fast! Tools automatically position themselves when slipped onto a locating pin and swung into the slot of the tool block. They don't even have to be aligned or clamped into position, as the precision fit of tool holder and tool block insures rigidity and accuracy.

Monarch Quik-Tools are specifically valuable in the toolroom or instrument shop for practically any type of turning, with tools used in any desired combination or sequence. The standard tool setups can be used, without adjustment to tool settings, for a wide variety of jobs. Holders are designed for standard tools and gages.

How about it? Don't you want to know *all* about how Monarch Quik-Tool eliminates lengthy setups and cuts tool change time to seconds? Send for our complete illustrated booklet today . . . ***The Monarch Machine Tool Company, Sidney, Ohio.***

**Fill Out This Coupon and Clip to Your Business Letterhead, Please.**

Monarch
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

**THE MONARCH MACHINE TOOL COMPANY,**
**SIDNEY, OHIO**

Please Send Me Your Illustrated Quik-Tool Booklet #306.

NAME_____

TITLE_____

CUSTOMER SPECIFIED
Color indicates machined surfaces
A leading automotive manufacturer recently specified a multi-purpose production machine to perform a combination of rough and finish milling, horizontal and vertical drilling operations. Specifications called for a single machine that would do all these operations with increased efficiency and lower production costs.
Feed Slide Unit
Quill Feed Unit
Rotary Index Table
Lead Screw Tapping Unit
Way-Type Drill Unit

# Kearney & Trecker offers you standard

Illustrated here are several standard units which Kearney & Trecker incorporates in automatic production machines that perform a combination or series of drilling, milling, boring and tapping operations to exacting accuracies.

Kearney & Trecker combines these standard design units with a minimum of special engineering to keep production machine costs at a minimum. What's more, you get increased production at lower cost and higher efficiency. Such utilization of standard units provides the economies you want, from job-proven designs with minimum of capital investment.

**Standard Feed Slide Unit** — One of the most important developments, the Model B Feed Slide provides hydraulic feed for milling, boring or drilling heads. Available in four sizes (determined by width of ways), and each size in four different length cylinder strokes. A variety of feed cycles is possible — single, fine and coarse, single skip, double skip and feed return. (Data Sheet No. 1019a.)

**Standard Quill Feed Unit** — Simplifies and speeds production of machines which perform drilling, boring, reaming, counterboring and chamfering operations. There's 10″ stroke and a spindle speed range of 200-1690 rpm, which is variable by change gears and sheave diameters. Single or multi-spindle arrangements are possible as well as single or double feed rates. (Data Sheet No. 1055.)

**Standard Rotary Index Table** — Designed especially for production machines, the Rotary Index Table is a rugged, accurate, self-contained unit for mounting various work-holding fixtures. Unit is available in four

KEARNEY & TRECKER
MILWAUKEE
DESIGNED

Kearney & Trecker designed and built this 6-Station Rotary Indexing machine — incorporating nine standard units — to perform a series of milling and drilling operations on rear axle differential carriers at the rate of 82 pieces per hour. Five feed slides, one quill feed unit, two drill power units, and a rotary index table are used. Such standardization of major machine components is the answer to higher production rates . . . lower maintenance costs.

# units for lower production machine costs

different table diameters — 36″, 48″, 60″ and 80″. (Data Sheet No. 1018a.)

**Standard Way-Type Drill Unit** — Designed for drilling, boring, reaming, counterboring and chamfering operations with heavy cutting loads. Entire unit can be mounted at any angle on a production machine. Single or multiple-spindle arrangements as well as single or double feed rates are possible. Completely self-contained spindle head has a speed range of 98-1691 rpm, with 72 increments . . . feed range of 1-16 ipm . . . 140 ipm rapid advance and 260 ipm rapid return. (Data Sheet No. 1075.)

**Standard Tapping Unit** — This compact, self-contained unit can be arranged to tap any thread from ¼″ to 1″ in diameter in both national coarse and fine series, in addition to six sizes of pipe taps. Spindle speeds range from 80-280 rpm with a choice of three motors, 1, 2 or 3 hp. Single as well as multi-spindle arrangements are possible. (Data Sheet No. 1074.)

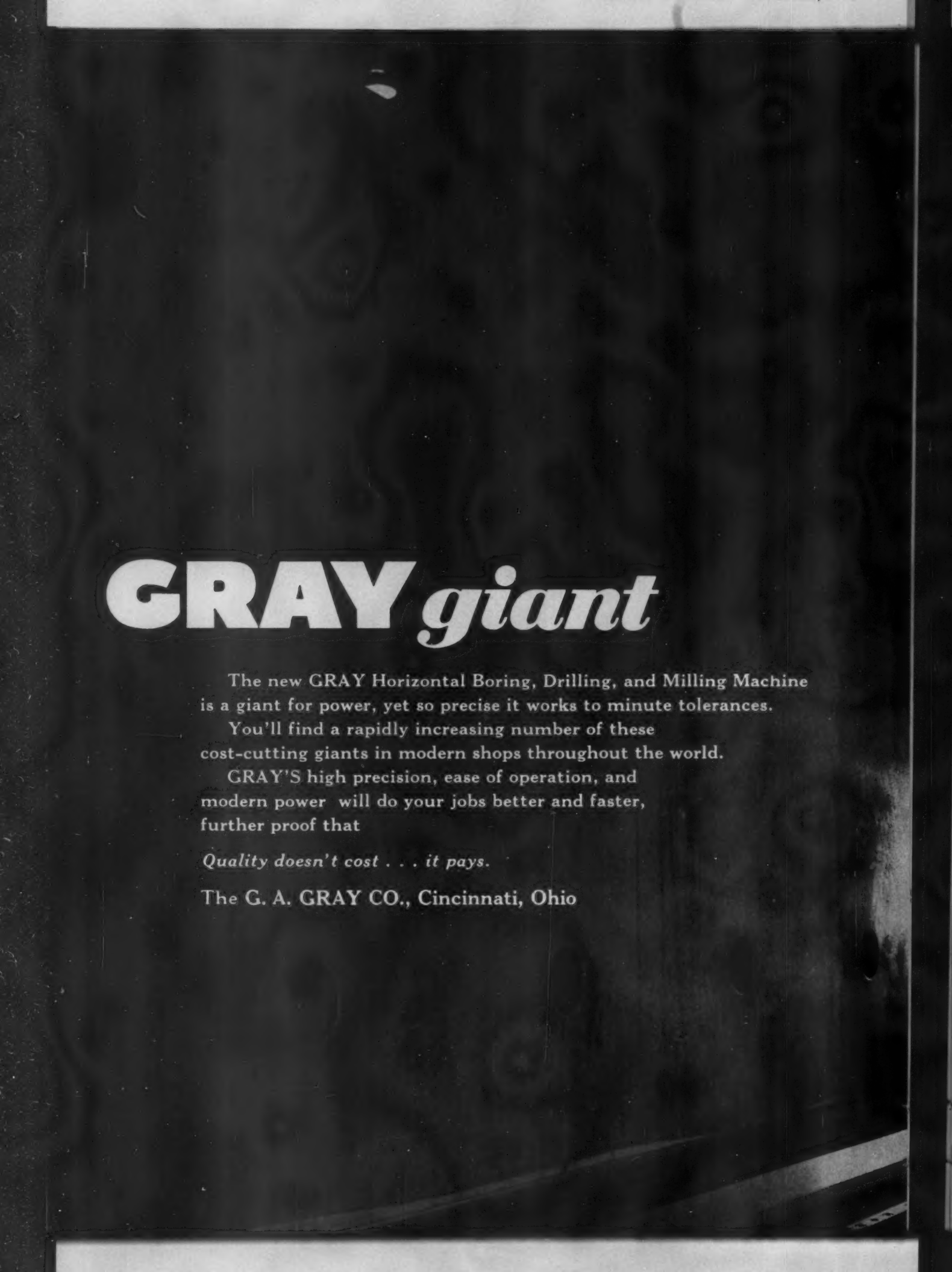
For more complete information on standard units, ask for Data Sheets listed under each unit; for details on the 6-Station Rotary Indexing machine, utilizing nine standard components, request Data Sheet No. 1076. See our nearest representative, or write Kearney and Trecker Corp.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

*Special Machinery Division*

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1893


GRAY giant
The new GRAY Horizontal Boring, Drilling, and Milling Machine is a giant for power, yet so precise it works to minute tolerances.
You'll find a rapidly increasing number of these cost-cutting giants in modern shops throughout the world.
GRAY'S high precision, ease of operation, and modern power will do your jobs better and faster, further proof that
Quality doesn't cost . . . it pays.
The G. A. GRAY CO., Cincinnati, Ohio

# New Fosdick Layout Machine does

***The new Fosdick Sensitive Radial Layout Machine combines a high-precision jig borer table with our sensitive radial drill.***

**Table gives cross movement.**

Vee and flat construction with precision screw in center of vee insures easy, precise movement through full 18″ of travel. Graduated dial shows thousandths. A scale is included for rough measurements. Rapid traverse is available.

**Head is traversed for length movement.**

Roller bearings support weight of head on hardened steel ways. Total length of travel, 34″. Measurements are made by graduated dial on traverse bracket. Head rapid traverse is also available.

**Vertical adjustment of table by power.**

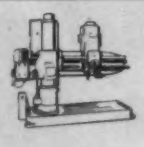
Vertical adjustment, 16½″. Maximum distance from spindle to table top, 23″.

**Other features**

One-piece column construction, 12″ diameter. Fixed-height arm swings 360° around column. Arm and column clamps hold accurate position while drilling. Direct-reading feed and speed selecting levers. Safety feed clutch. 3 hp motor. Nine spindle speeds, 60 to 1200 rpm or 175 to 3500 rpm. Four spindle feeds, .004″ to .020″ or .002″ to .010″ per revolution.

# Use it also as a Radial Drill!

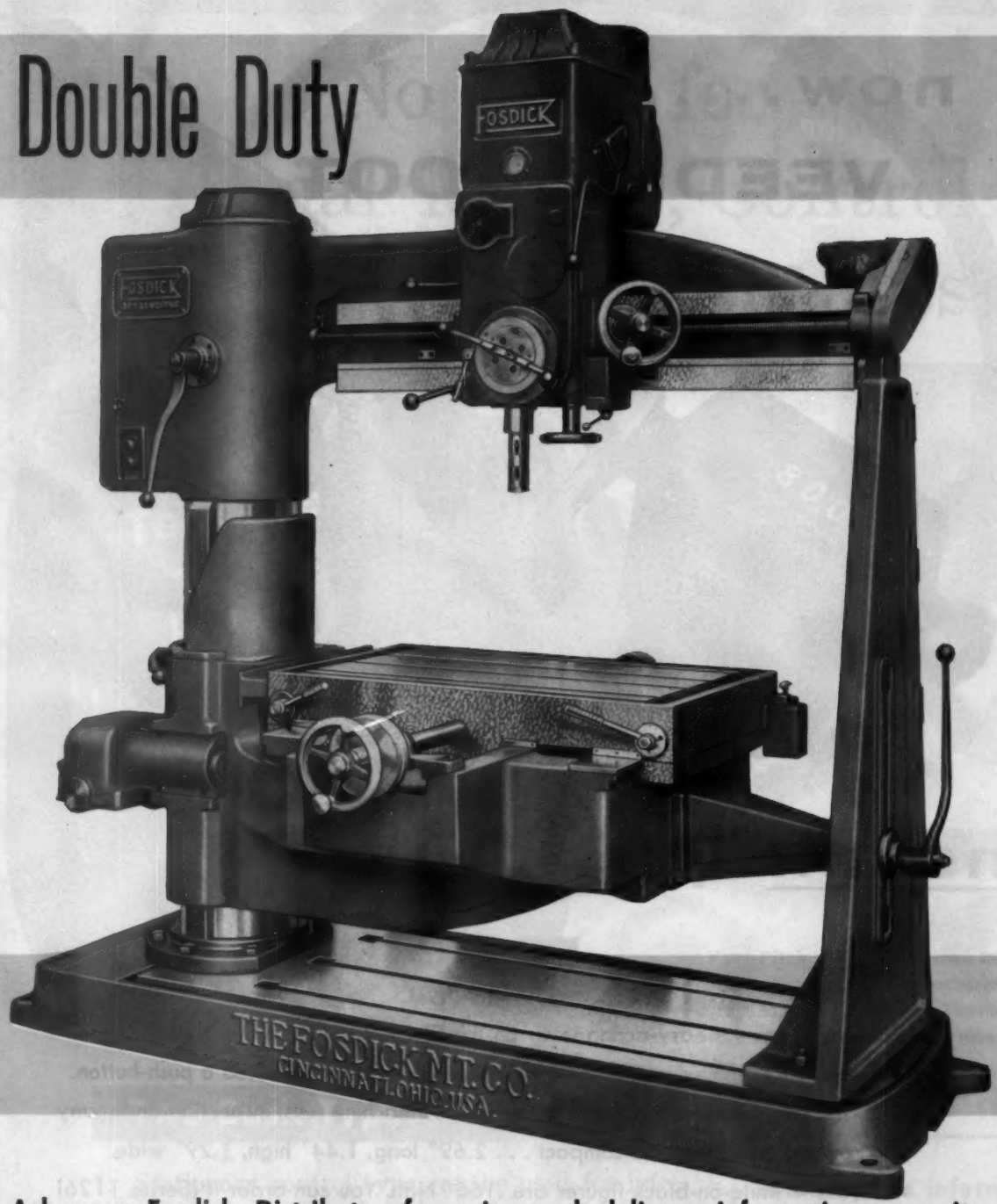
Simply remove the filler block between end of arm and outboard support and your Layout Machine becomes a Radial Drill! Work can then be mounted on the adjustable table and position reached by swinging arm and moving head. To drill large work pieces *entire* outboard support can be easily removed.



Fosmatic Radial Drills

Jig Borers

# Double Duty




**Ask your Fosdick Distributor for price and delivery information or write factory.**

*Need Drilling Equipment? Get a Proposal from Fosdick!*

Sensitive and Upright Drills

Sensitive Radial Drills

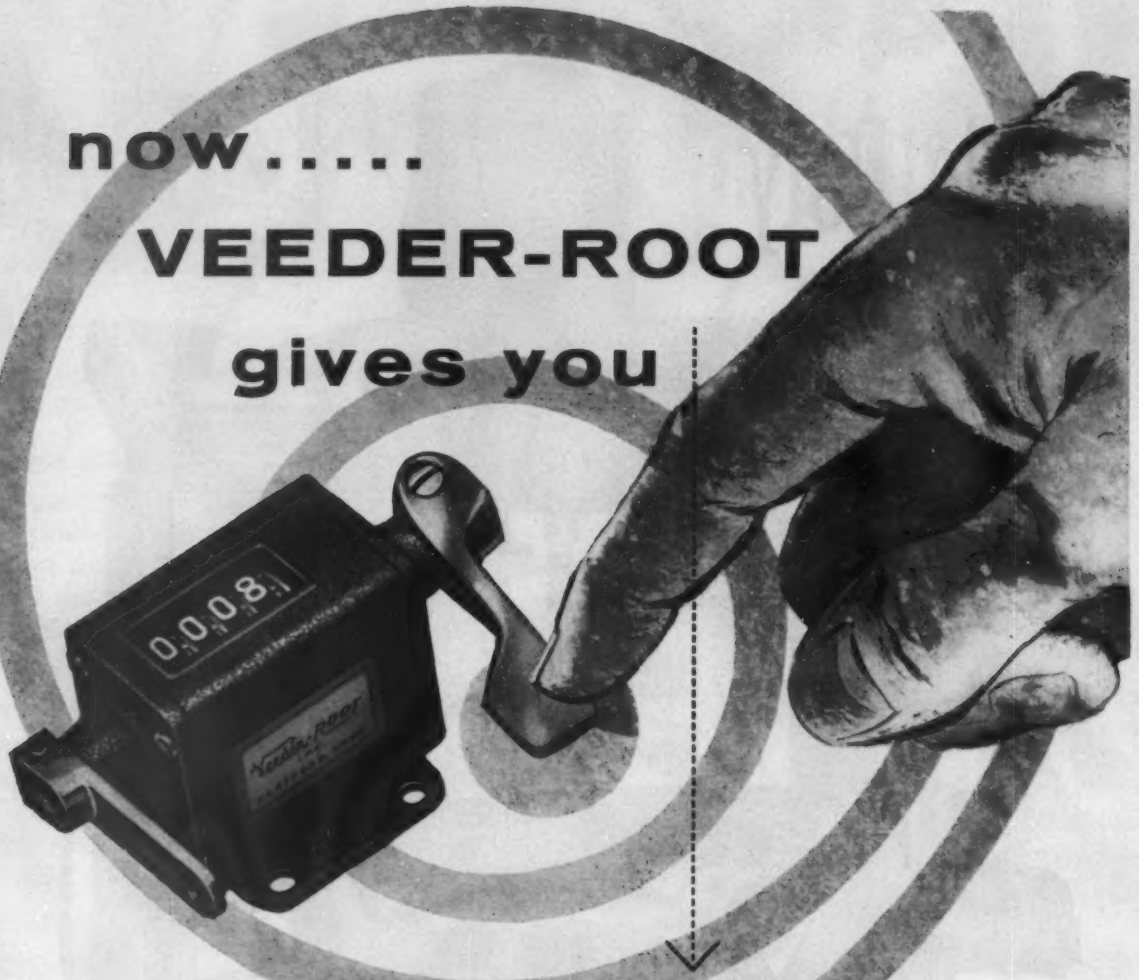
Jig Grinders

Automatic Positioning Jig Borers

**FOSDICK**

**THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO**

# now.....
# VEEDER-ROOT
# gives you



# instant "push-button" resetting

Just press the easy-acting lever on this Quick-Reset Ratchet Counter . . . *and all 4 figures reset to zero as instantly as though you used a push-button.* This saves time and speeds work on short machine runs, inspection and many other jobs. Counter is compact . . . 2.69″ long, 1.44″ high, 1.29″ wide. The 4 white-on-black figures are .166″ high. You can order it (Series 1126) from stock right now . . . just like scores of other Veeder-Root Counters for manual, mechanical and electrical operation in every field from electronics to atomics.

**VEEDER-ROOT INCORPORATED**
HARTFORD 2, CONNECTICUT
Greenville, S. C. • Chicago 6, Ill.
New York 19, N. Y. • Montreal 2, Canada
Offices and Agents in Principal Cities

*EVERYONE CAN COUNT ON*
**VEEDER-ROOT**
"THE NAME THAT COUNTS"

# No need for Special Motors, Control with *Vari-Pitch* Sheaves

***Vari-Pitch* sheaves are the low cost way of providing accurate stepless speed control. There's a type and size for every need.**

## Two Basic Types

**1.** Stationary control type can be used for infrequent speed changes when sheave is at rest.

**2.** Motion control type is available for applications requiring repeated speed changes while drive is in motion.

Both types are available in standard range sheaves to provide speed variations to 196%, and in wide range type sheaves to provide variations to 400%.

**For complete information**
call your nearby A-C office or distributor — or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. A-4843

*Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

**ALLIS-CHALMERS**

# KEEP YOUR PRODUCT

# a Step Ahead of

# COMPETITION

## Through Lower Costs . . .
## Increase Efficiency . . .
## Greater Production Output . . .

**Unless your present equipment is as modern as the Bullard Horizontal Boring, Milling and Drilling Machine, Model 75, you are not employing all of today's engineering achievements to your manufacturing methods. You owe it to yourself to investigate the many advantages to be gained by using the Bullard Horizontal Boring, Milling and Drilling Machine, Model 75 in your plant.**

HERE ARE SOME OF ITS FEATURES

**PENDANT CONTROL** – complete machine control from a movable pendant station. Feed and speed rate selection, directional feed and traverse engagement of the spindle, head, table and saddle, spindle rotation and operation of head binders are accomplished from the Pendant.

**BOTH SCREW AND RACK FEED** – to the spindle provide smooth, steady screw feed for boring and sensitive hand feed for small drilling and tapping.

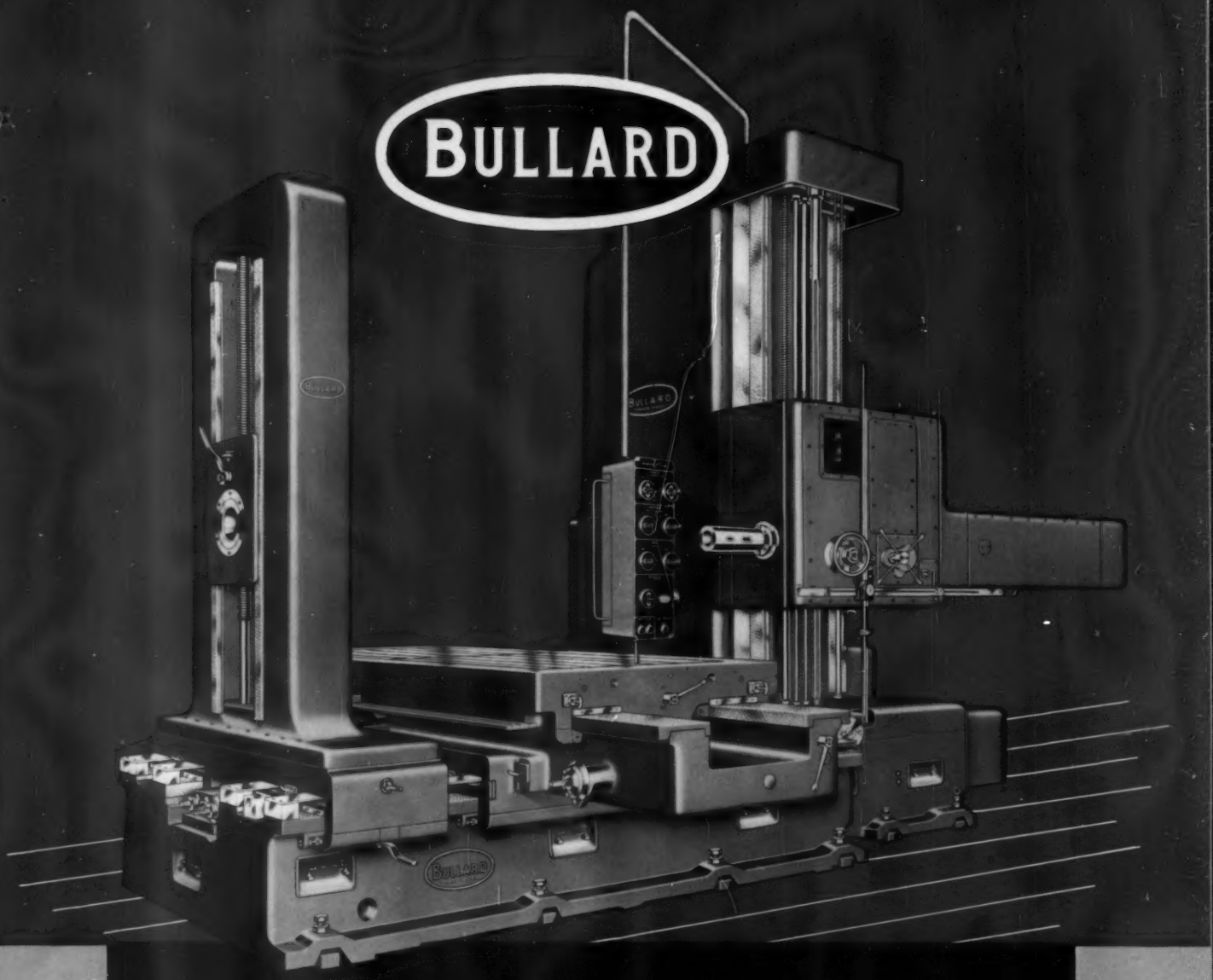
**SPEED RANGES** – 9.5 to 2032 R.P.M. on 3″, 7 to 1510 R.P.M. on 4″ standard and 5.8 to 1209 R.P.M. on 4″ heavy duty and 5″ sizes, meets any machining requirement.

**RIGIDITY** – is built into the massive 4-Way Bed, Head, Headpost and Rear Post assuring a higher degree of maintained accuracy.

**OPTICAL MEASURING EQUIPMENT** – for head and table (optional)

**AUTOMATIC POSITIONING** – for head and table (optional)

BULLARD



HORIZONTAL BORING, MILLING AND DRILLING MACHINE

*Model 75*

FOR COMPLETE INFORMATION WRITE FOR CATALOG HBM-75 OR CALL YOUR NEAREST BULLARD SALES OFFICE OR DISTRIBUTOR.

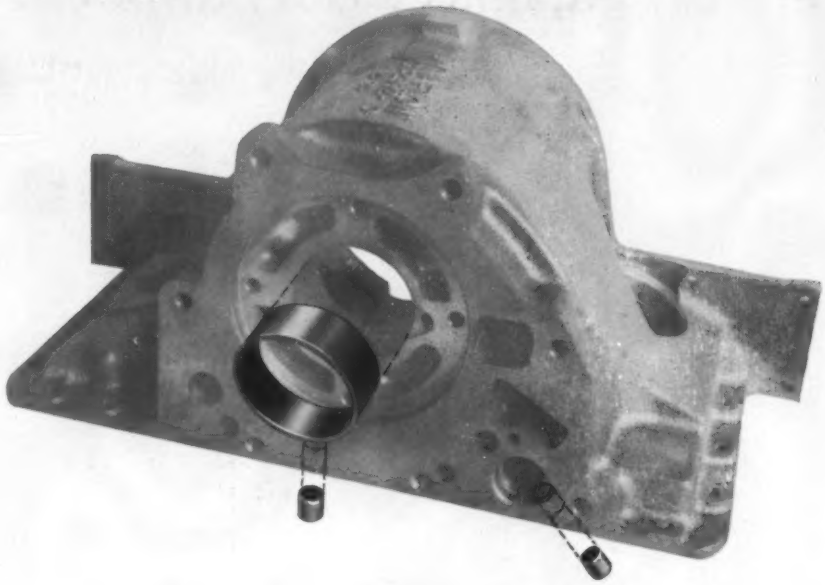
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

ANOTHER

American

FIRST

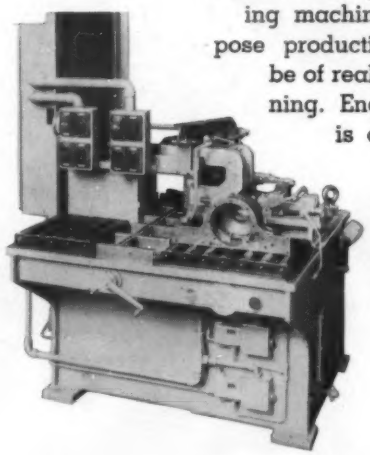


# 3 parts assembled from 3 different angles

## IN ONE AUTOMATIC MACHINE OPERATION

Parts magazines (indicated by arrows) are manually loaded with bushing and plug parts. Transmission case from right hand conveyor is turned 90° and pushed into position by operator. Push button starts machine cycle, case is automatically clamped, and bushing and two plugs are pressed into case simultaneously by hydraulic cylinders. As case is automatically unclamped, operator places it on outgoing conveyor.

Designed for an automotive conveyor-type assembly line this American Hydraulic Press inserts a bushing and two dowel plugs in an automotive transmission case — all three parts from different angles — in a single, push-button controlled, automatic cycle. It is a typical result of the service that American offers for designing and building automatic assembling and broaching equipment.



American's experience in developing machines for special purpose production operations can be of real value to your planning. Engineering versatility is a proven American asset.

A letter or 'phone call outlining your requirements will be welcomed—and will produce prompt cooperation.

AMERICAN American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

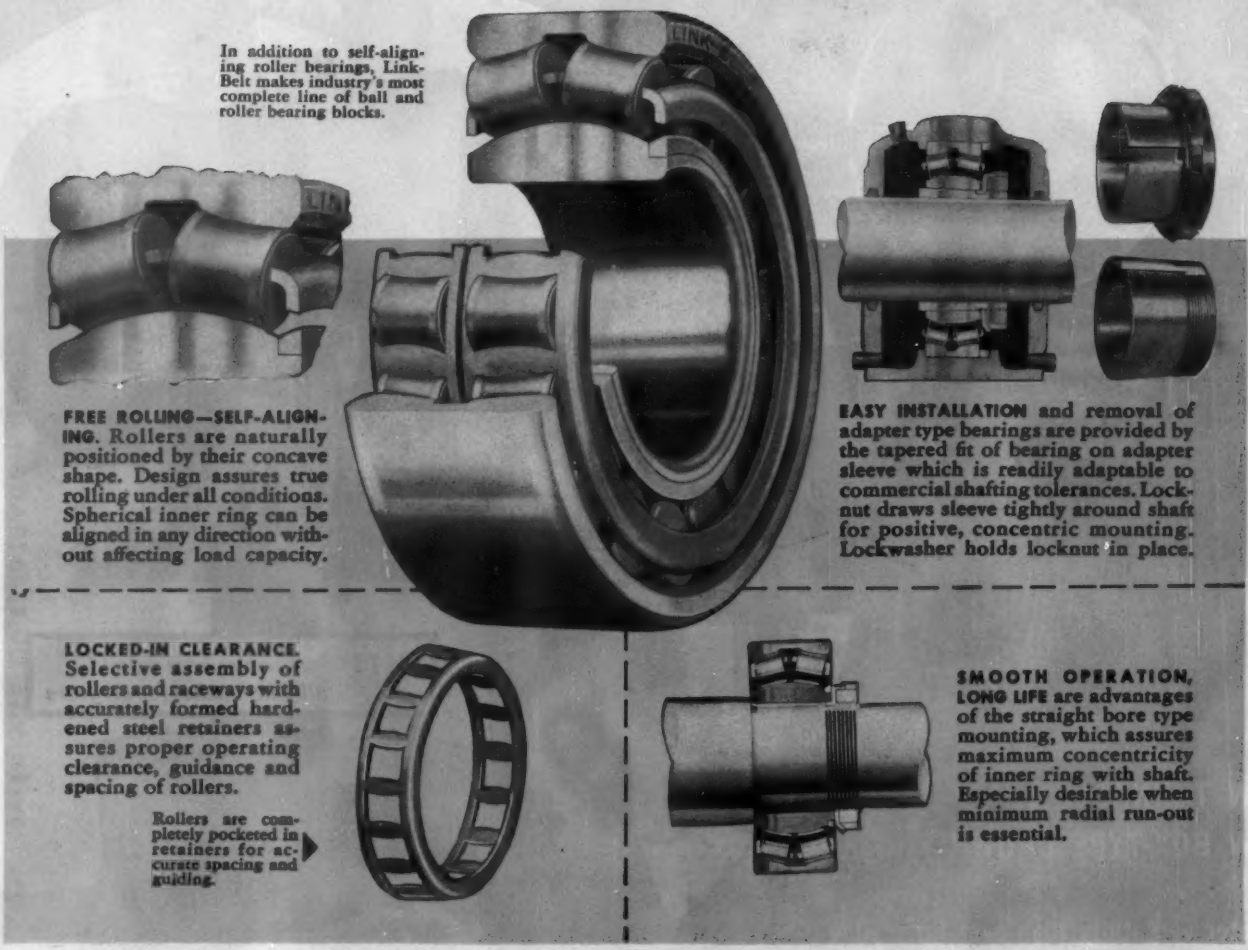
ANN ARBOR, MICHIGAN

SUNDSTRAND

**See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery**

# For tough, heavy-duty applications...make use of these important

# bearing differences



In addition to self-aligning roller bearings, Link-Belt makes industry's most complete line of ball and roller bearing blocks.

**FREE ROLLING—SELF-ALIGNING.** Rollers are naturally positioned by their concave shape. Design assures true rolling under all conditions. Spherical inner ring can be aligned in any direction without affecting load capacity.

**EASY INSTALLATION** and removal of adapter type bearings are provided by the tapered fit of bearing on adapter sleeve which is readily adaptable to commercial shafting tolerances. Locknut draws sleeve tightly around shaft for positive, concentric mounting. Lockwasher holds locknut in place.

**LOCKED-IN CLEARANCE.** Selective assembly of rollers and raceways with accurately formed hardened steel retainers assures proper operating clearance, guidance and spacing of rollers.

Rollers are completely pocketed in retainers for accurate spacing and guiding.

**SMOOTH OPERATION, LONG LIFE** are advantages of the straight bore type mounting, which assures maximum concentricity of inner ring with shaft. Especially desirable when minimum radial run-out is essential.

## *They're all present only in LINK-BELT self-aligning roller bearings*

SUBTLE differences in bearings can make notable differences in the life and efficiency of your equipment. Take Link-Belt self-aligning roller bearings, for example. Their "self-contained" feature permits the bearing to float axially in the mounting, when desired, compensating for shaft expansion or settling of bearing supports . . . preventing extraneous thrust loads from being set up between bearings on the same shaft. What's more, inherent self-aligning design and preadjustment preclude use of expensive or cumbersome self-aligning housings.

Ask your nearest Link-Belt office or authorized stock-carrying distributor for Book 2196 on self-aligning roller bearings and Book 2550, containing full data on all Link-Belt ball and roller bearings.

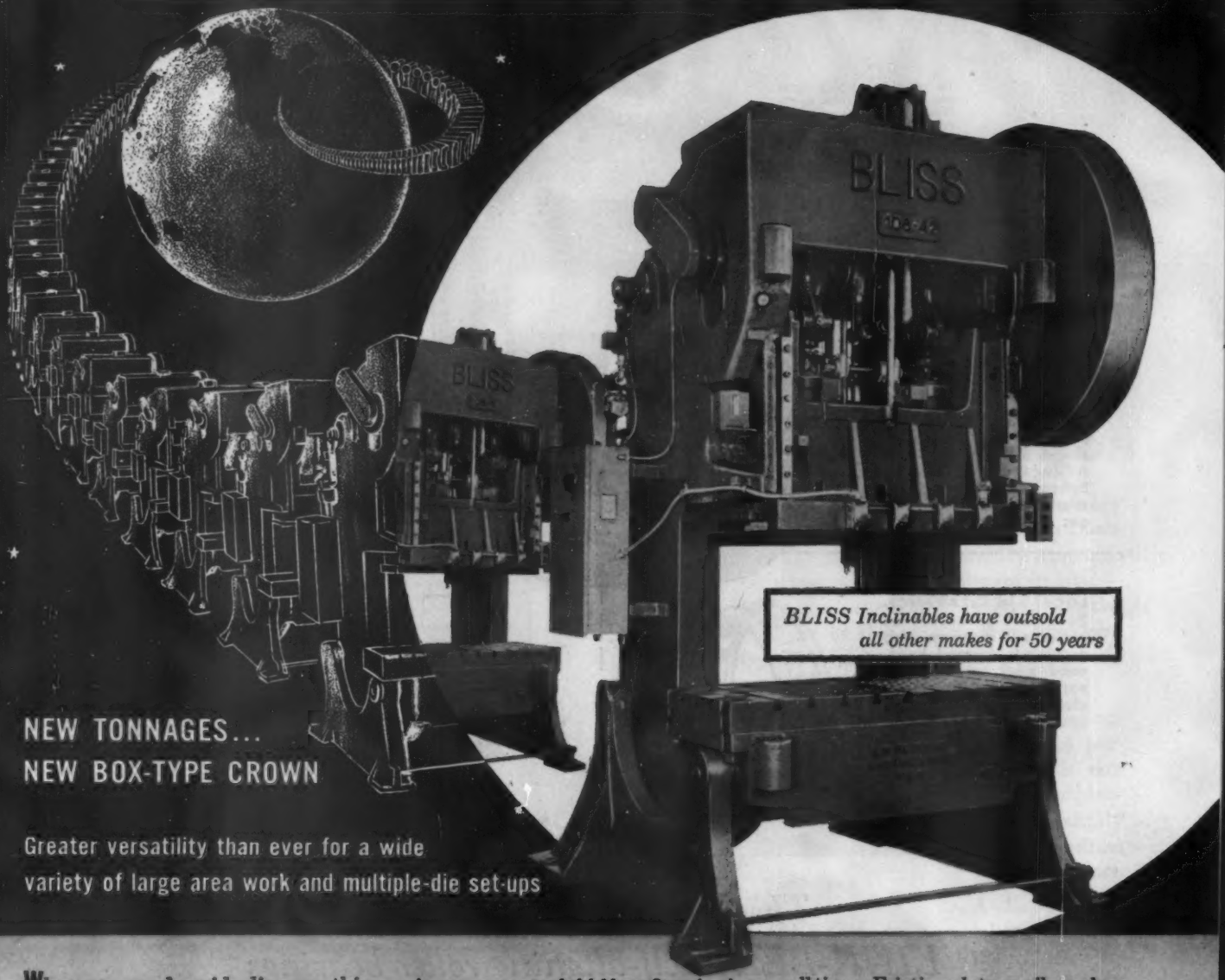
**LINK-BELT**

**Ball and Roller Bearings**

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 12.711-A

# • • • • • • • INTRODUCING BLISS' NEW

# DOUBLE-CRANK INCLINABLE SERIES




*BLISS Inclinables have outsold all other makes for 50 years*

**NEW TONNAGES...**
**NEW BOX-TYPE CROWN**

Greater versatility than ever for a wide variety of large area work and multiple-die set-ups

When you need a wide die area, this is the press to handle tough blanking, forming, drawing, perforating.

Add a Bliss pneumatic cushion (the press is set up to receive it) and you extend the range of *draw* work.

For high production work, the addition of a Bliss feed (single or double roll, dial) will give you runs of 200 or more strokes per minute.

**Improvements Add New Standards of Accuracy**

• *New, Heavy Box-Type Crown*—the same as is used on rugged Bliss automotive presses—adds mass, rigidity ... minimizes deflection. Gives 100% up-snug bearing support. Adds strength through entire cast Meehanite gap frame. Keeps slide in perfect alignment even under unusual off-center loads.

• *Air Friction Clutch and Brake*—cool-running. Automatically adjusts for wear, making for fast action between full brake and engagement at all times. Friction plates easily replaceable without tearing down clutch.

• *Other Features*—Precision gibbing, roller bearings, extra-heavy ball-seat connections, heavy-duty forged shaft.

• *All Parts Available from Stock*—Parts are interchangeable and available from stock through any Bliss sales office.

• *Reasonably Priced*—Only Bliss offers a standard double-crank inclinable (to 175 tons) and with it offers the same low cost value as all Bliss Inclinables. Write for catalog and information about our Deferred Payment Plan.

**E. W. BLISS COMPANY, CANTON, OHIO**

BLISS
SINCE 1857

*is more than a name... it's a guarantee*

# This Photo is One-Third Actual Size...

**OF A COMPLETE VEELOS V-BELT INVENTORY IN THE O, A, B AND C WIDTHS!**

Put an end to endless space and inventory problems. Four reels of Veelos adjustable v-belt replace up to 316 different sizes of endless belts... and take up a space of only 16 inches square.

**VEELOS**
THE BALANCED
LINK V-BELT

Over 350 distributors throughout the country. Veelos is known as Veelink outside the United States.

**ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE**

**WRITE FOR A FREE COPY...** of the Veelos Data Book. It's packed with valuable engineering data complete with illustrations. Send for your copy today.

**MANHEIM MANUFACTURING & BELTING CO.**
**601 Manheim St., Manheim, Pa.**

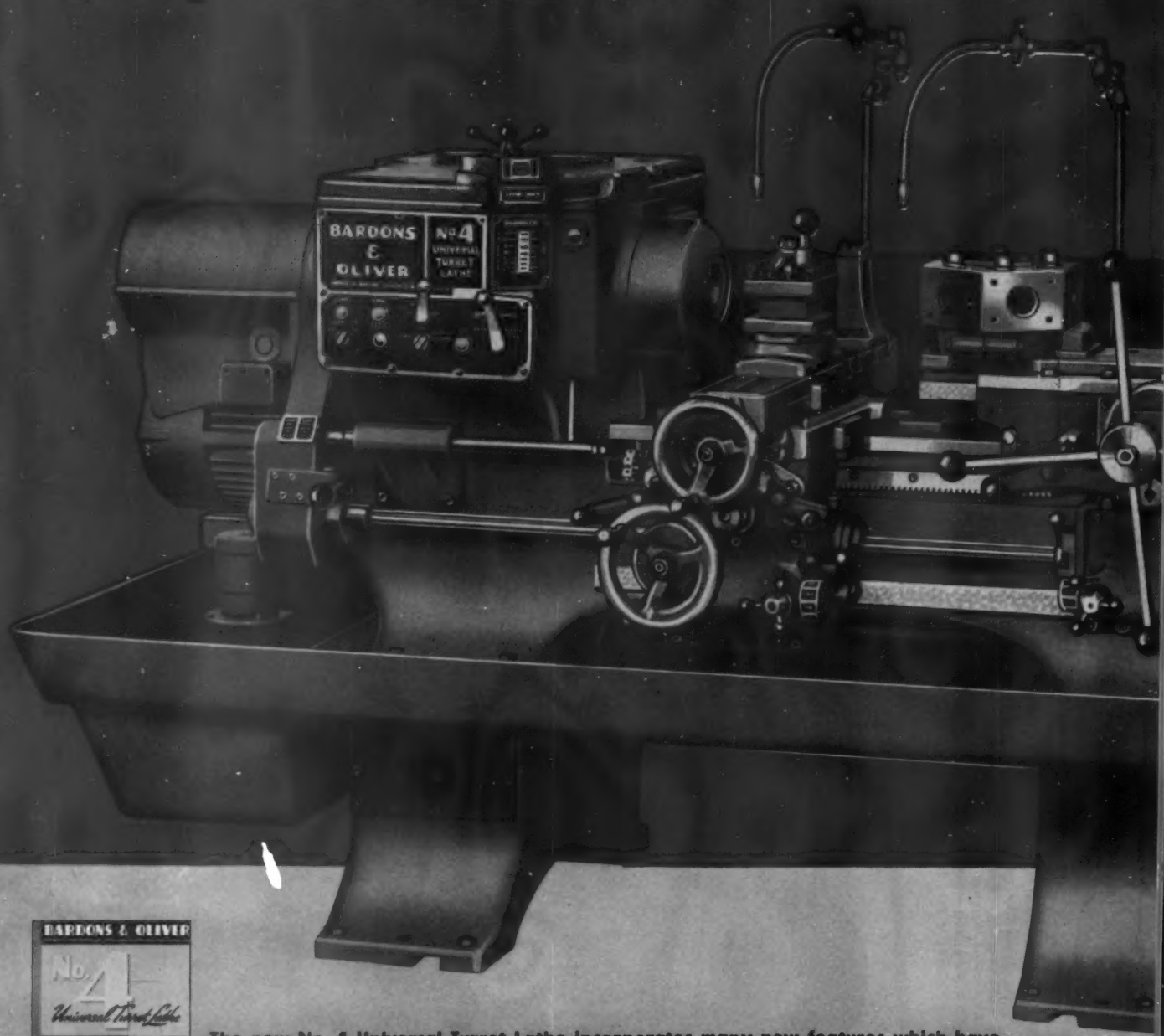


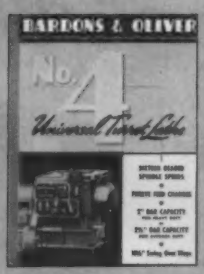

201

BLISS SINCE 1867

*is more than a name . . . it's a guarantee*

# THE NEW BARDONS & OLIVER No. 4 Universal Turret Lathe...




Write us on your company's letterhead for this new Catalog.

**The new No. 4 Universal Turret Lathe incorporates many new features which have sharply increased its productive capacity while lessening the physical effort required of the operator.**

**A larger selection of spindle speeds, covers a wider overall range. Spindle speeds are instantly preselected and changed. Tool carrying stations have increased rigidity and accuracy. Controls are regrouped for handier and faster manipulation. Wider selection of feeds are provided with positive jaw feed clutches and easier engagement levers.**

**Power transmitting capacity is adequate to accommodate motors of ample horsepower for the latest developments in cemented carbide tooling.**

**We welcome the opportunity to quote production estimates on individual requirements.**

# Features:

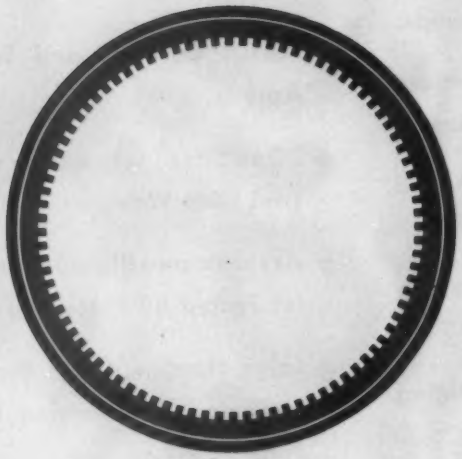
- Sixteen Geared Spindle Speeds, providing a fifty to one speed range.
- Three optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant Horsepower (optional to fifteen) at all spindle speeds.
- Fast operating and effortless Electric Headstock Clutches.
- Fully Automatic Spindle Speed Changing.
- 100% anti-friction bearing headstock and aprons.
- Flanged Type Motor Mounting with reduced overhang.
- Diagonal Cross Ribbing full length of bed and underneath headstock.
- Replaceable Bed Ways of Solid Hardened and Ground Alloy Steel.
- Replaceable Hardened and Ground Steel Turret Slide Saddle Ways, Gibs, and Top Caps.
- Large Hexagon Turret and deep Turret Slide of exceptional accuracy and rigidity.
- Twelve Quick Feed Changes for Cross Slide, Carriage and Hexagon Turret.
- Single Dial Feed Selectors on both Aprons.
- Positive Tooth Feed Clutches with "Easy Action" Engagement Levers.
- Sealed Carriage and Saddle Aprons.
- "One Shot" lubrication of all Tool Slide Ways.
- Accurate and Rigid Square Turret Sealed by Protective Skirt.
- Large Hardened and Ground-in-Thread Ball Bearing Cross Slide Screw.
- Anti-Backlash Adjustable Nut on Cross Slide Screw.
- Built-in Bar Feed Stop providing extra Turret Tool Station.
- Faster Hydraulic Bar Feed and Collet Chuck.
- Only one Bar Feed Setting for a full length of Bar Stock.
- Impeller Type Coolant Pump with Integral Motor Drive.
- Optional Collet Chuck Capacities (2″ or 2½″ diameters).

MANUFACTURERS OF TURRET LATHES AND CUTTING-OFF LATHES

**BARDONS & OLIVER, INC.**

1134 WEST 9TH STREET • CLEVELAND 13, OHIO


This is not intended as a joke: the machine tool that was ▸ *paid for* long since may



**you can drive to the poorhouse**

This is not intended as a joke: the machine tool that was *paid for* long since may today produce an annual loss equal to its cost of replacement. We know, because Avey equipment has helped many companies to stop losing money on antiques, and make money so fast that the investment was paid for in a year or year and a half. Why?

Because Avey production drilling machines are essentially simple, compact, straightforward in design, built in standard units that fit together to fit your job, and function with standard work-holding fixtures. When a production run is finished, the units are often rearranged for another job, at a fraction of the cost of the original setup, and the owner gets an even bigger bonus of earnings.

Are you really convinced that your drilling operations are now running at top efficiency? Send us your part prints and if we can't be convinced, too, *you stand to gain.*

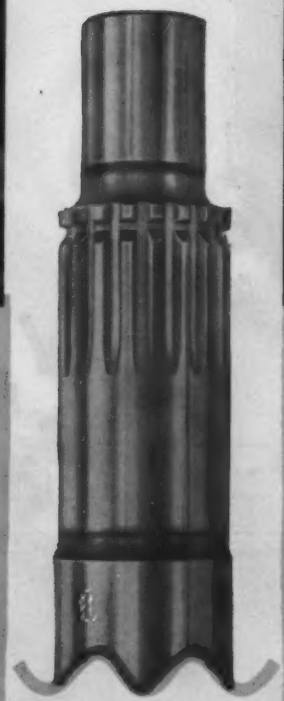
This Avey machine mills 88 slots in a stainless steel jet engine part—a slot every 40 seconds. Vertically mounted automatic cam feed unit produces desired cycle time. Cutter head can't operate unless automatic indexing table is in correct position. Our advanced Electrodex table makes it easy to change fixture and part quickly with only slight change in indexing mechanism.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

**...in a car that's paid for**

Avey

**drilling, tapping, production machines**



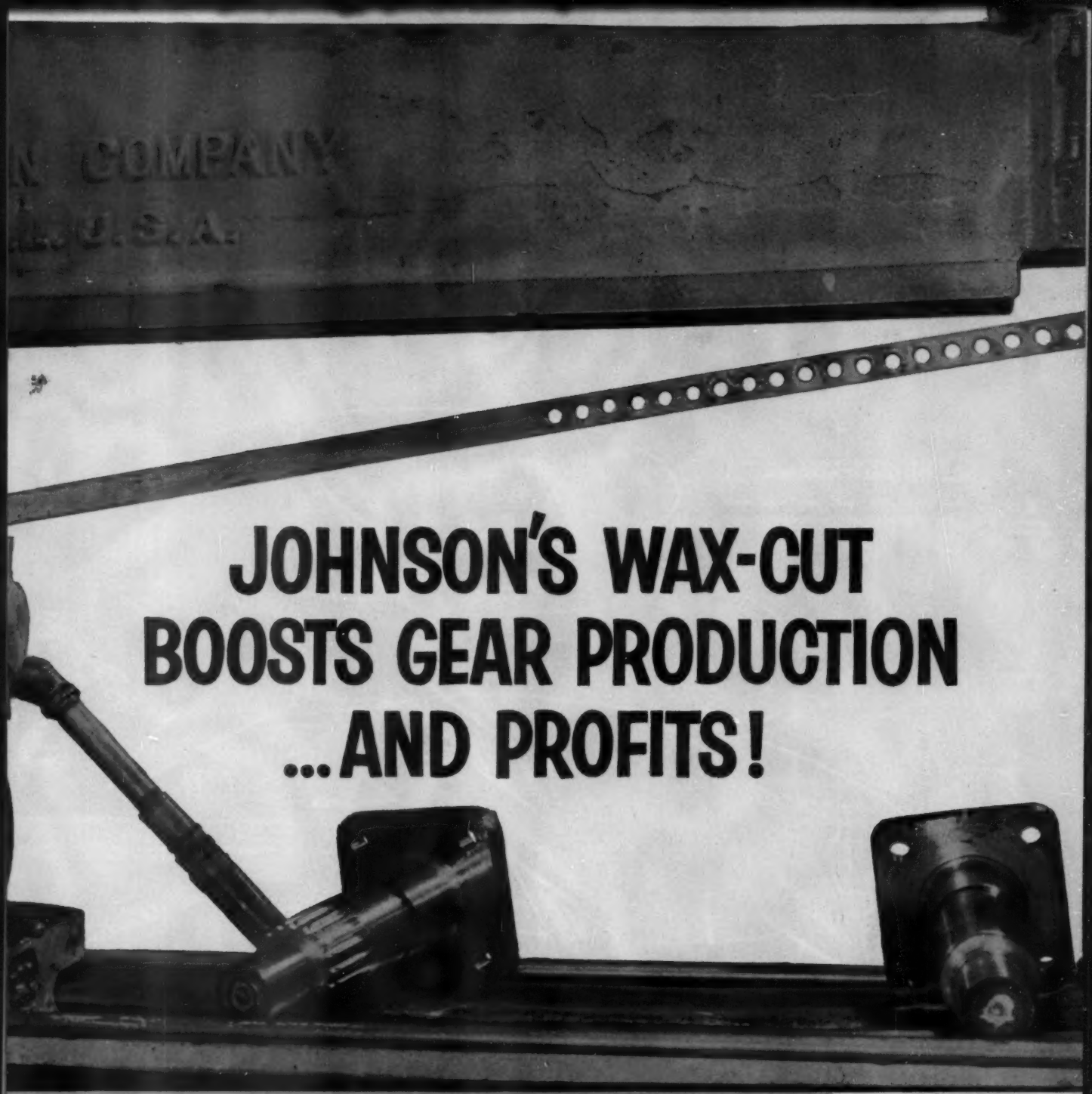
It takes an exceptional cutting oil to hob perfectly matched transmission gears from hardened steel. Even a slightly worn hob produces errors in tooth spacing and contour, therefore the cutting oil must provide unusual lubrication to reduce hob wear to an absolute minimum.

That's why Johnson's is selected for this type of job. Wax-Cut contains specially formulated waxes that provide positive lubrication even under extreme heat and pressure where conventional cutting oils fail to function.

Yes, if Johnson's can do *this* type of hobbing job it can make *your* tough jobs profitable . . . your run-of-the-shop jobs easy. If you are looking for increased production, longer tool life, less down time or better finishes, consider changing to Johnson's. It's guaranteed . . . it *must* be better.

PRODUCTS OF JOHNSON'S WAX

S. C. Johnson & Son, Inc.
Industrial Products Division, Dept. AM-12
Racine, Wisconsin



# JOHNSON'S WAX-CUT BOOSTS GEAR PRODUCTION ...AND PROFITS!

## Guarantee of Performance

WAX-CUT WAX-COOL TL-131

There is no risk in trying any of Johnson's Wax Cutting Fluids. The full purchase price will be refunded if any of the above products fail to meet the following conditions in your plant, in actual production:

1. Provide increased tool life.
2. Provide greater production where increased feeds and speeds can be employed.
3. Gain operator preference.

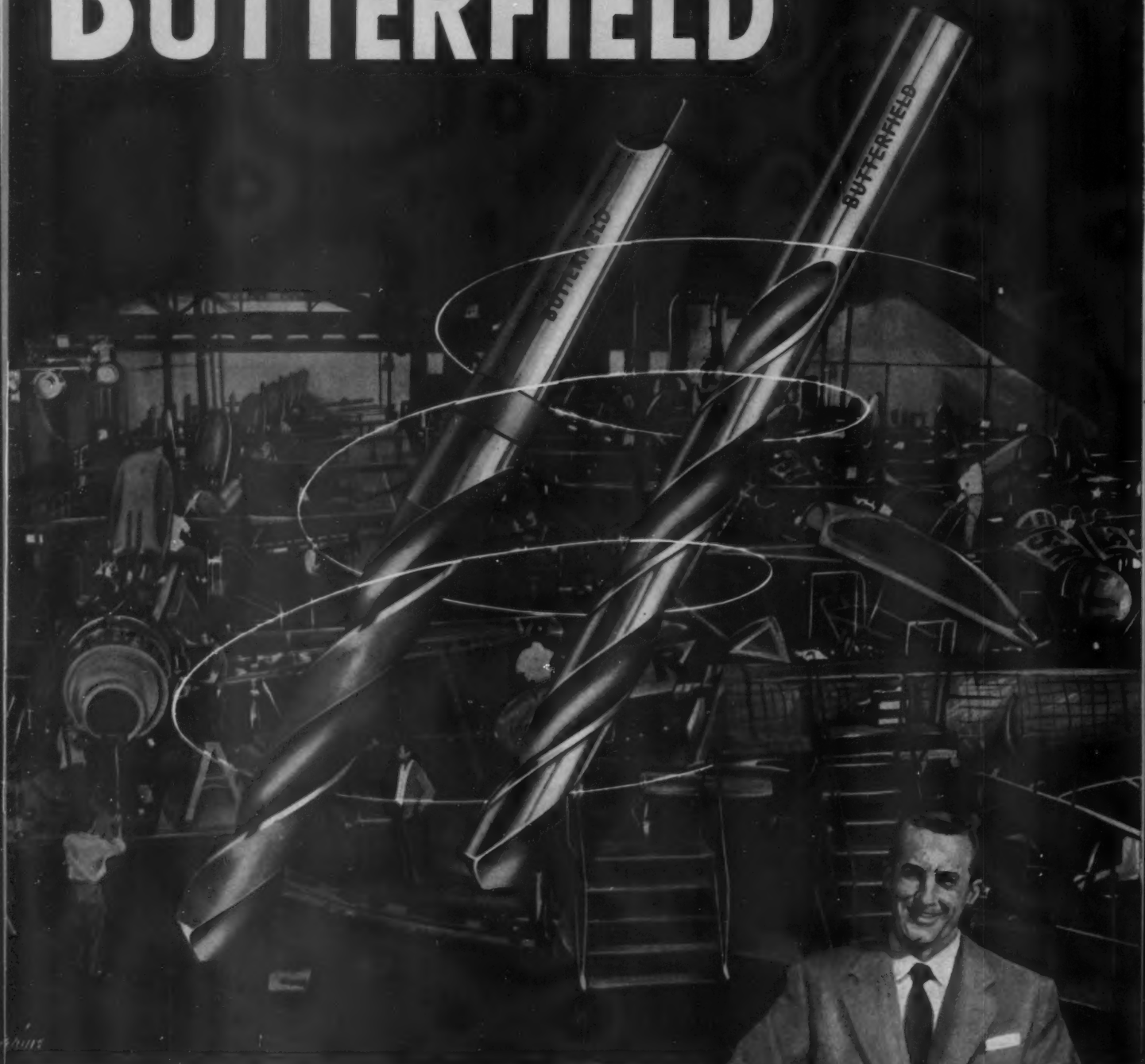
These three guaranteed advantages definitely increase the possibility of extra profits for your shop.

Johnson's Wax-Cutting Fluids are carried in stock by a leading industrial distributor in your area. Your local Johnson's Wax Industrial Distributor will be happy to arrange a trial in your shop . . .

For the name of the Johnson's Wax Distributor in your community, call Western Union by number and ask for

**"Operator 25"**

# BUTTERFIELD

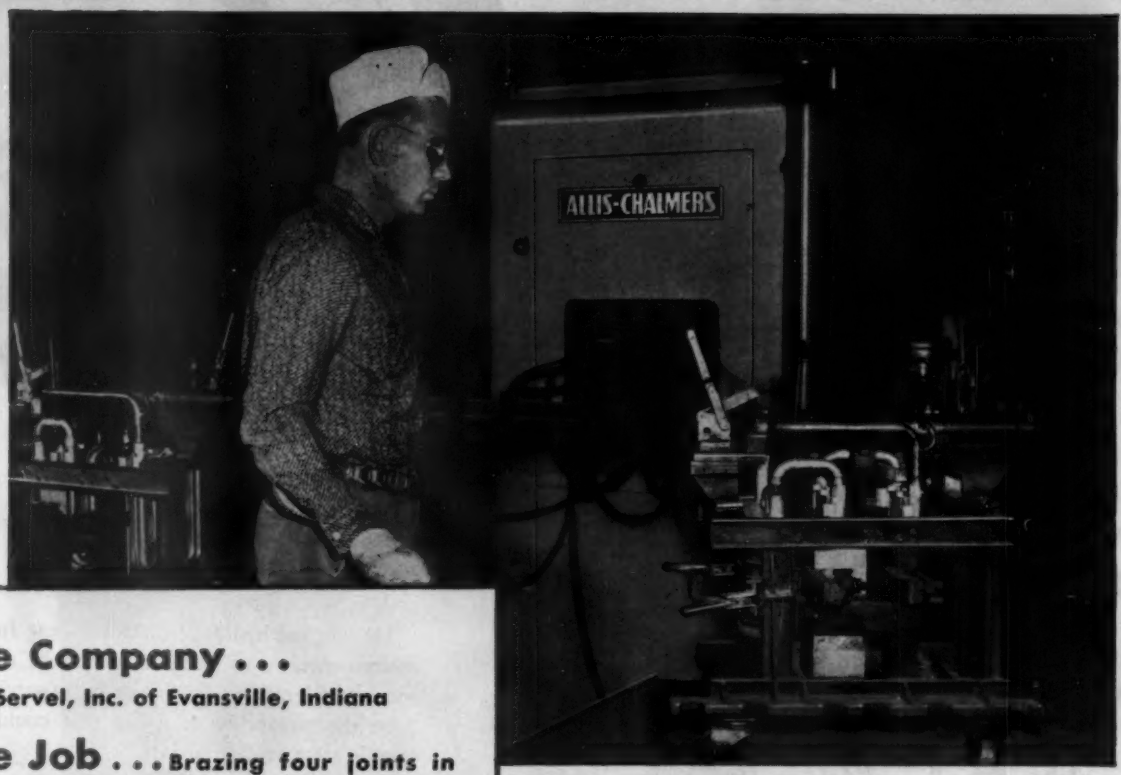



**A COMPLETE LINE OF QUALITY** cutting tools is now available from your Butterfield distributor. Drills are made to the same exacting standards as Butterfield Milling Cutters, Taps, Dies, Reamers, Counterbores and End Mills.

UNION TWIST DRILL COMPANY
**BUTTERFIELD DIVISION**
DERBY LINE, VERMONT, U. S. A.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD**
DISTRIBUTOR

# How Servel, Inc.
# Speeds Brazing Operations
## with Allis-Chalmers Induction Heaters




### The Company . . .
**Servel, Inc. of Evansville, Indiana**

### The Job . . . Brazing four joints in evaporator assemblies.

By using Allis-Chalmers Induction Heaters, along with special work fixtures and preformed brazing rings, joints are heated to 2100 F in seconds; 120 joints or 40 evaporator assemblies can be completed in an hour.

### Here's the setup . . .

An operator and four assemblers are stationed at each of the seven heaters in the plant. Assembly components are gathered from an overhead conveyor and placed in caster-equipped fixtures. Using a split coil arrangement, the operator alternately brazes two assemblies — one on the right table and one on the left table. Only one coil can be energized at a time. While the coil at the right is applying heat, the coil at the left is positioned. Shutoff is controlled by an automatic cycle timer.

### What induction heaters can do for you . . .

Whether you're handling long production runs, small odd-lot jobs, or a mixture of both—here's a tool that affords plenty of profit opportunities. A mere change of the working coil allows you to braze, heat, harden, solder, or anneal. Easy adaptability to many types of setup holds production changeover time and cost to a minimum. And, though heating operation is fast, it provides close heat control.

Interested in knowing more? Then contact your nearby A-C District Office or write—Allis-Chalmers, Milwaukee 1, Wisconsin.

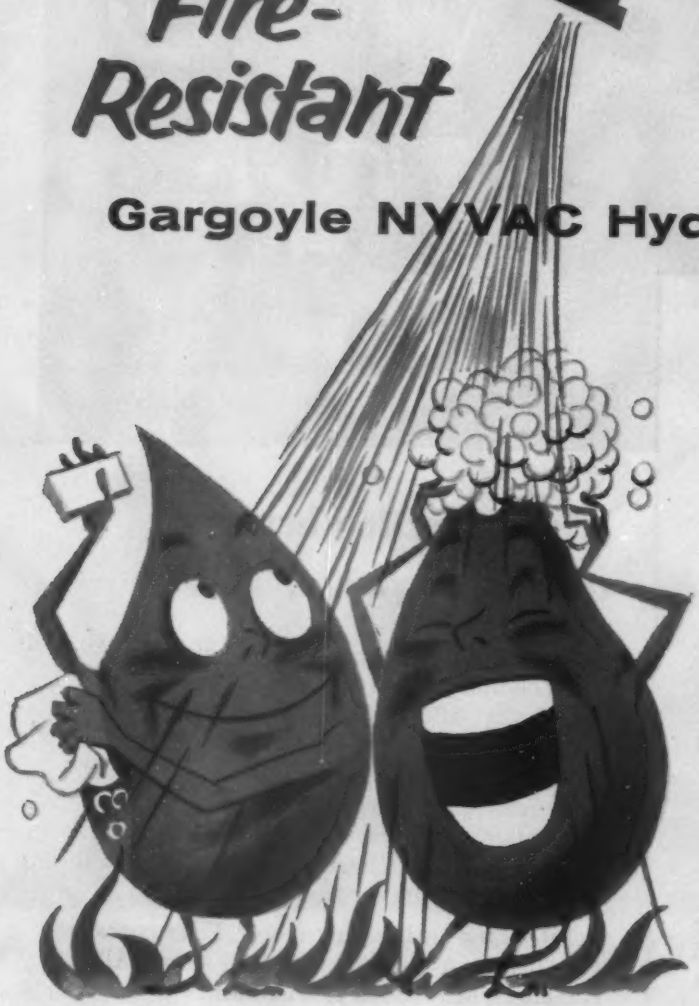
# ALLIS-CHALMERS

A-4725

Now—here's
real fire prevention
for your plant . . .

# New Fire-Resistant

## Gargoyle NYVAC Hydraulic Fluids



Do you use hydraulic machines near furnaces, molten metal pots, red-hot steel slabs or other sources of ignition? If so, with oil in service, you have the possibility of a fire that could badly cripple your production.

New fire-resistant Gargoyle Nyvac hydraulic fluids will help prevent such fires.

There are two types of these fluids—a straight synthetic fluid and a synthetic water base fluid. Both have been thoroughly proved in the field. Your particular machines and operations will dictate which product is best for your plant.

Although synthetic in composition, these new products are still designed to keep your machines running on full production schedules with low maintenance costs. They are backed by Socony Mobil's complete engineering service.

The new Nyvac fluids round out Socony Mobil's complete line of top-quality hydraulic fluids—all available from a single source of supply. Call your Socony Mobil man for complete details.

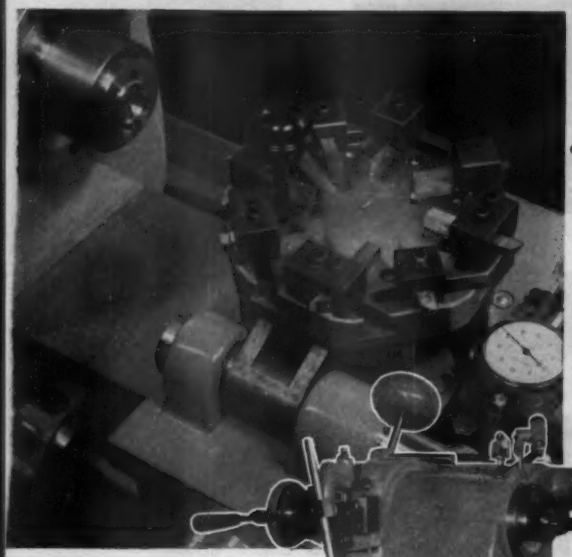
**Socony Mobil** *Correct Lubrication*

**FIRST STEP IN CUTTING COSTS**

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

HARDINGE
ELMIRA, N.Y.

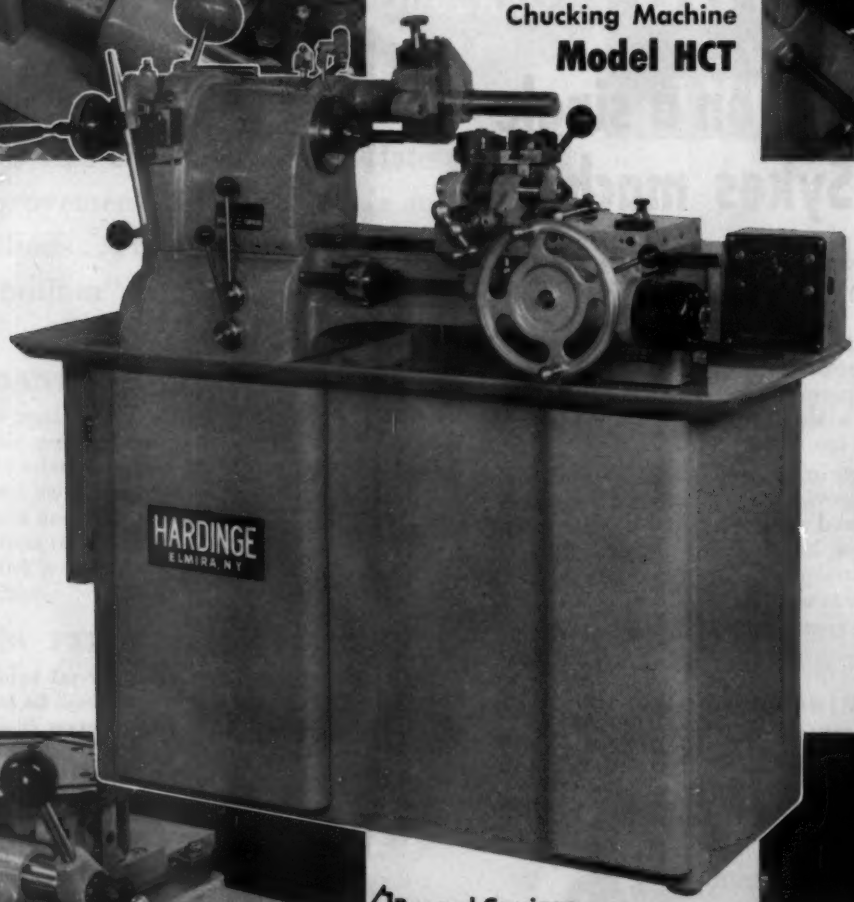
# "Closer Tolerances Increase Demand for the HARDINGE HCT Precision Chucking Machine"



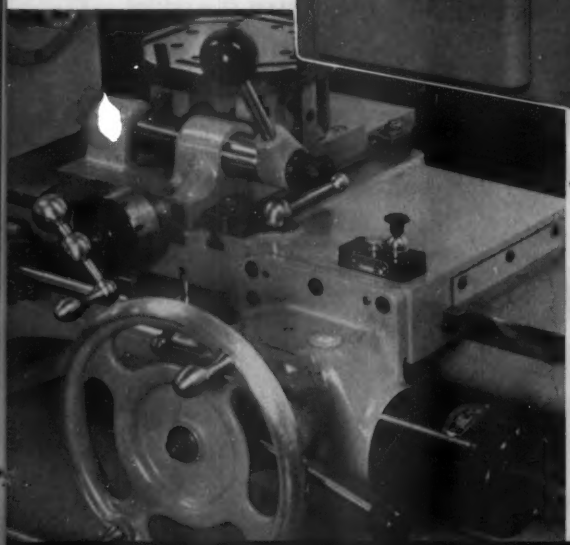
8-Station Turret

Flexible Range of Operation

High Speed Precision
Chucking Machine
**Model HCT**



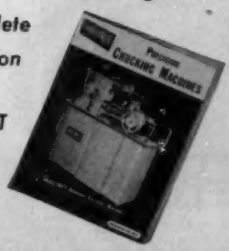

Hardinge Model HCT Precision Chucking Machine finishes diameters, recesses, shoulders, back faces, front faces, and cuts precision threads *in one setting – all concentric* with each other. Tooled inexpensively with standard tool bits.

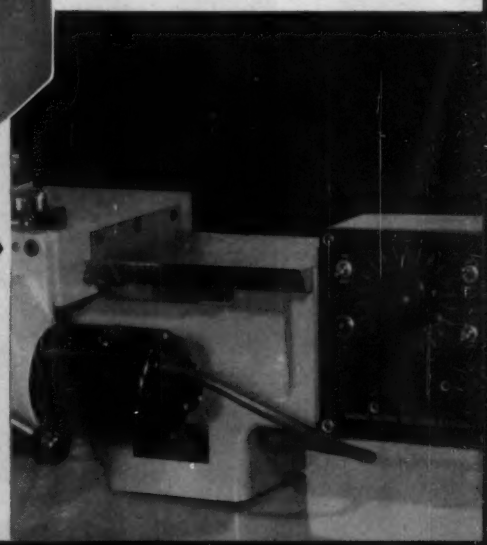


Rugged Carriage

Independent Variable Carriage Feed

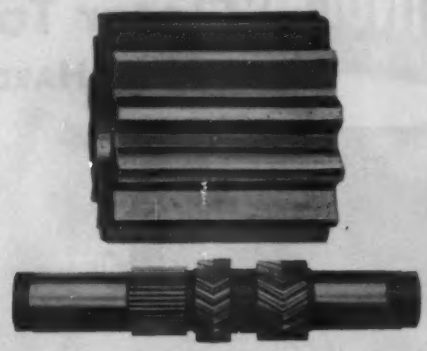
*For complete information write for Bulletin HCT*



**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE



# 8 PRECISION GEARS

## ...all generated on a single Farrel-Sykes machine

Those eight gears should give you some idea of the versatility of a Farrel-Sykes "Twin-Head" generator.

The gear machine is made with the work axis horizontal, the position in which the gears themselves run. This permits a wide variety of work to be handled on a single generator—controls the work positively, too.

Built with high initial precision, "Twin-Head" generators are provided with means of compensating for wear and sustaining accuracy for thousands of operating-hours. Other important benefits are faster cutting speed, reduced setup time, and ease of operation.

Write for details of this versatile gear generator, today.

**FARREL-BIRMINGHAM COMPANY, INC.**
ANSONIA, CONNECTICUT

*Plants:* Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
*Sales Offices:* Ansonia, Buffalo, New York, Cambridge (Mass.), Akron, Cleveland, Chicago, Los Angeles, Houston

Types of gears illustrated (from top to bottom): spur • gear component with integral shaft • continuous-tooth herringbone • single helical • double helical with staggered teeth • double helical, staggered-tooth, with center groove • herringbone rack and pinion • cluster.

Farrel-Birmingham®

FB-1032

# NOW IS THE TIME . . . and here is the way!

## To Reduce Manufacturing Costs with a . . .

SEVENTY FIFTH BULLARD ANNIVERSARY 1880 1955

# CUT MASTER VERTICAL TURRET LATHE

**This revolutionary new design of vertical turret lathe has exclusive features never before offered on machines of this type . . . takes full advantage of the latest improvements in cutting tools and methods . . . truly the machine with a "built-in" future.**

. . . Model 75

AVAILABLE IN 26, 36, 46, 56, 66, AND 76 INCH SIZES

**PENDANT CONTROL . . .**

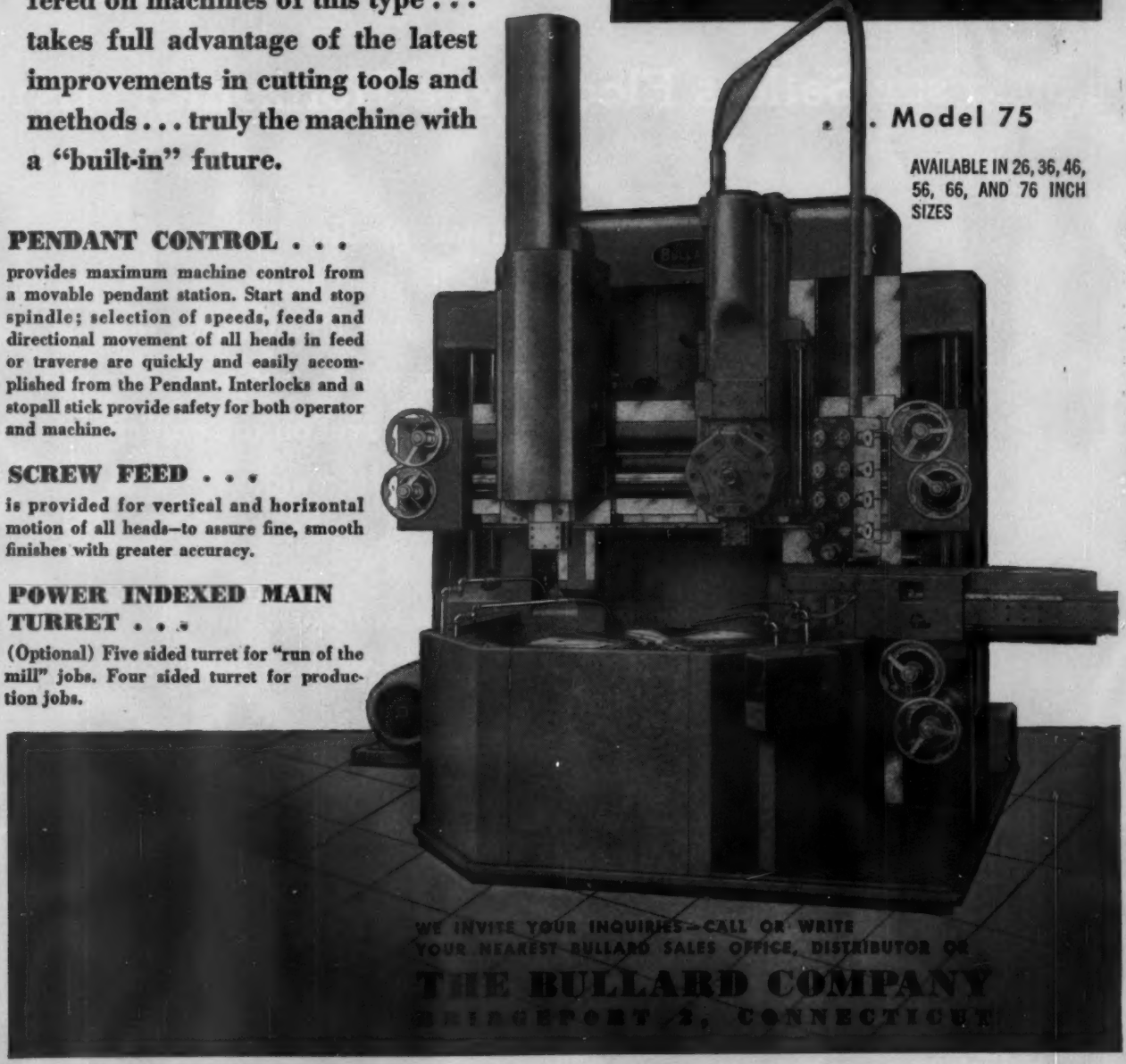
provides maximum machine control from a movable pendant station. Start and stop spindle; selection of speeds, feeds and directional movement of all heads in feed or traverse are quickly and easily accomplished from the Pendant. Interlocks and a stopall stick provide safety for both operator and machine.

**SCREW FEED . . .**

is provided for vertical and horizontal motion of all heads—to assure fine, smooth finishes with greater accuracy.

**POWER INDEXED MAIN TURRET . . .**

(Optional) Five sided turret for "run of the mill" jobs. Four sided turret for production jobs.



WE INVITE YOUR INQUIRIES—CALL OR WRITE YOUR NEAREST BULLARD SALES OFFICE, DISTRIBUTOR OR

**THE BULLARD COMPANY**

BRIDGEPORT 2, CONNECTICUT

# GIANT SIZE!

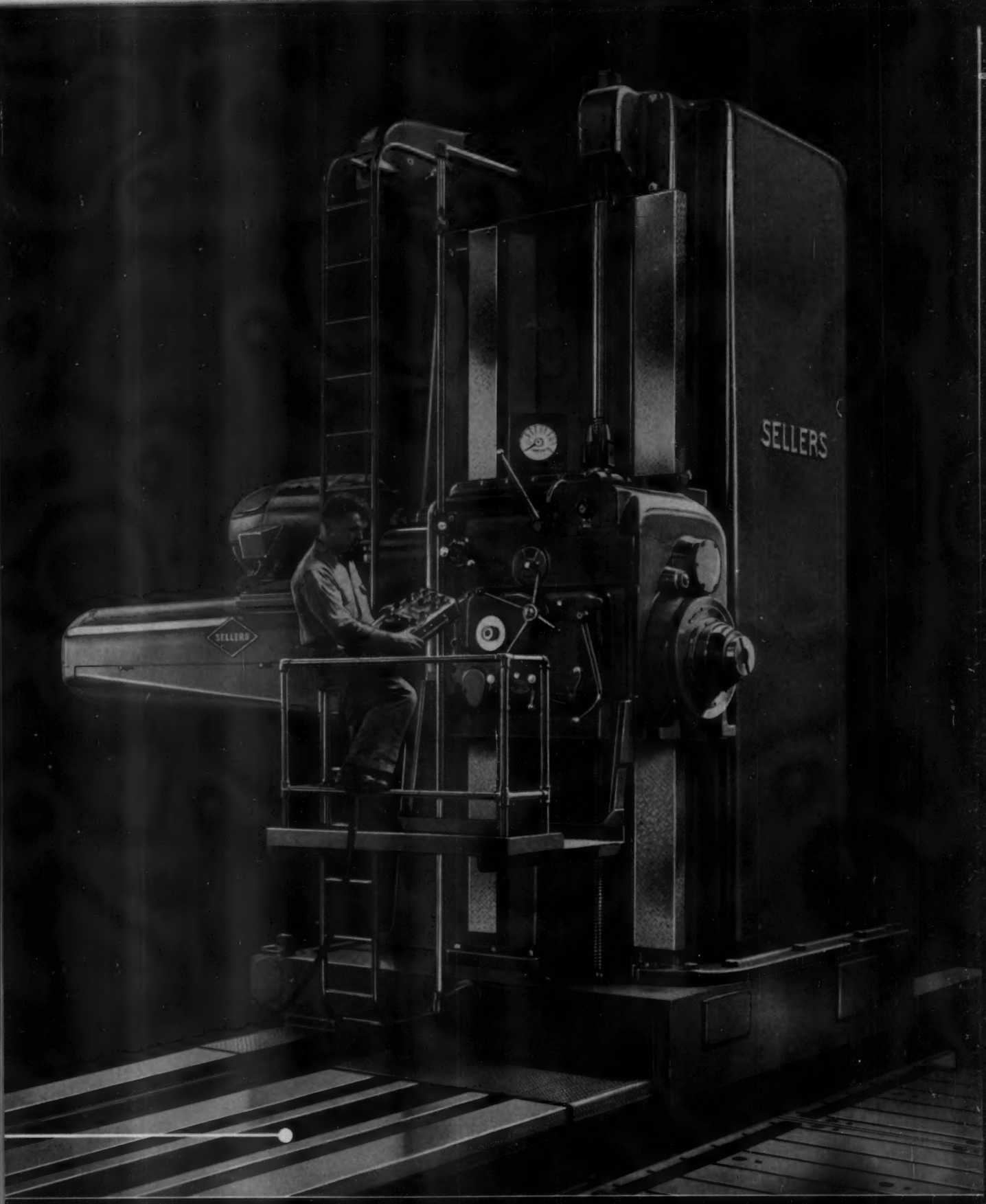
THE GIANT SIZE **Sellers Floor Type Horizontal has:**

A 10 inch diameter spindle
An 8 foot spindle feeding stroke
A runway that measures 9 feet across the ways
A column that measures 4½ feet across its ways
Up to 15 feet of head travel on the column
A 100 horsepower driving motor

It is a big machine for big work, but with its electronic push-button control, it handles like a small one.

CONSOLIDATED MACHINE

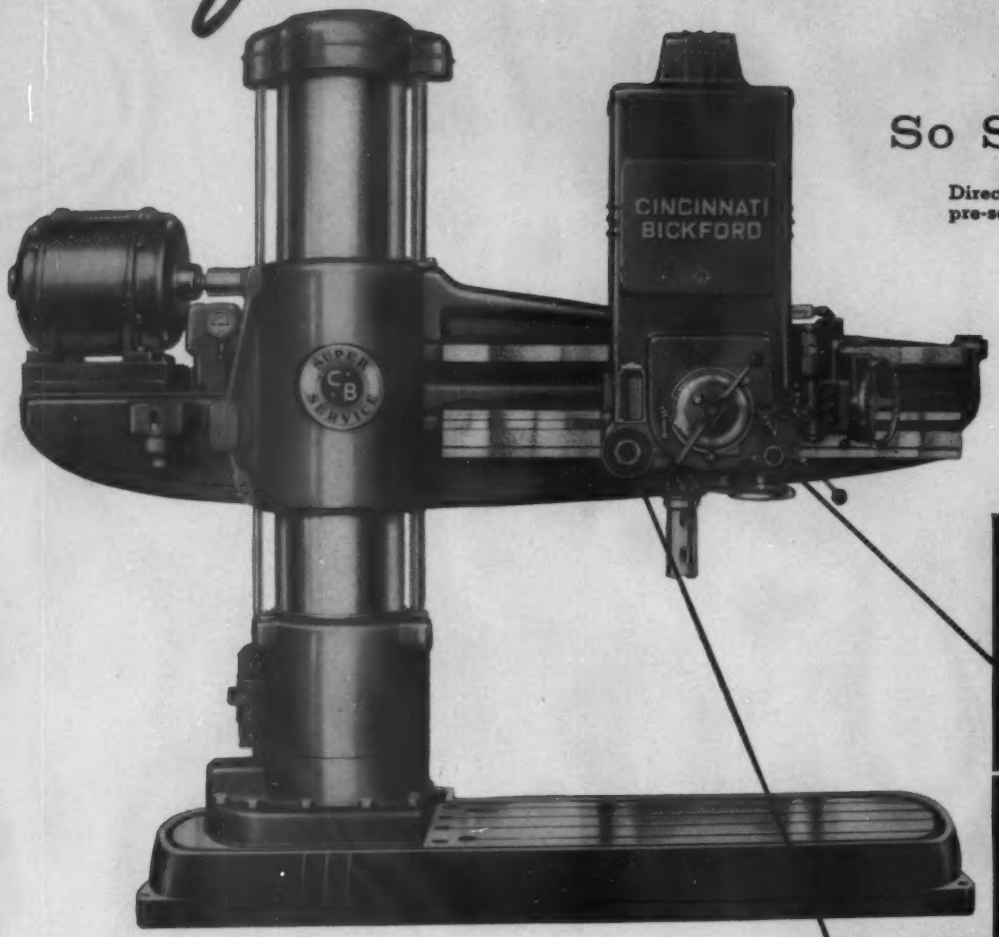
A DIVISION OF FARREL-




TOOL COMPANY ROCHESTER 10, NEW YORK

BIRMINGHAM CO., INC.

# So *quick*... So EASY...




## So SIMPLE...

**Direct and quiet shifting into pre-selected speeds and feeds.**

**HYDRAULICALLY PRE-SELECTS all 18 feeds**

Positive geared tap leads and feeds are quickly pre-set.

**HYDRAULICALLY PRE-SELECTS all 36 speeds**

Speeds and tool diameters shown in large easy to read figures.

**Super-Service Radials are available with complete hydraulic pre-selection of all 36 speeds and 18 feeds. Two convenient direct reading dials control the automatic shifting of sliding gears. While the tool is cutting, merely set the dials to the speed and feed for the next operation. As the spindle is stopping for inserting the next tool, the shifting is done hydraulically . . . directly, quietly and quickly. No other operations—no loss of time. Write for catalogs.**

**CINCINNATI BICKFORD**

**RADIAL AND UPRIGHT DRILLING MACHINES**

## THE CINCINNATI BICKFORD TOOL CO.

**Cincinnati 9, Ohio, U.S.A.**

Subsidiary of GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin.

**Here's a real test for quality**...if you can make the punch holder glide up the pins just by squeezing—and hold its position without sinking back—it shows that the fit between pins and bushings is well-nigh perfect. The "finger-tip" action is typical of all DIECO die sets small enough to squeeze this way...and the larger ones are just as perfectly fitted.

# What does "quality" in a die set mean to you?

If it means a perfect fit between pins and bushings...shoes that are absolutely parallel and stay parallel under load...*all* parts finished to precise tolerances with such unfailing regularity that there is never any variation in accuracy and serviceability among different die sets from the same source...then it stands to reason you must already be a user of DIECO die sets.

- Hardened steel pins superfinished and individually gaged to 0.0002" tolerance.
- High-tensile steel shoes, stress relieved and precision machined.
- Choice of bronze-plated bushings on hardened steel backing or hardened steel bushings—all with grease fittings. Precision ground and micro-honed to less than a "tenth" tolerance; can be arranged for pressure lubrication.
- Welded or screw shanks; any length guide pin.
- 1728 combinations in steel or semi-steel; interchangeable parts speed delivery.

## E. W. BLISS COMPANY

BLISS SINCE 1857

**DIE SUPPLY DIVISION**

DIECO

**1400 Brookpark Road, Cleveland, Ohio**

*Industry's most complete line of die sets and die makers supplies*

**DIE SETS • GUIDE PINS • BUSHINGS • SPRINGS**
**SOCKET HEAD SCREWS • 5001 ITEMS**

**DIE SUPPLY PLANTS AND OFFICES**

BUFFALO, N. Y.
440 Terrace Blvd., Depew, N. Y.
BURBANK, CALIF.
816 N. Hollywood Way
CHICAGO, ILL.
8033 South Kenton Ave.
CLEVELAND, OHIO
1400 Brookpark Rd.
DAYTON, OHIO
311 Vermont Ave.
DETROIT, MICH.
20201 Sherwood Ave.
PITTSBURGH, PA.
122 S. Sheridan Ave.
SAN JOSE, CALIF.
7th and Commercial St.

**DISTRIBUTORS**

BIRMINGHAM, ALA.
Ford Tool and Carbide Co.
3716 Tenth Avenue North
CAMDEN, N. J.
Fidelity Tool Supply, Inc.
309 Vine Street
CEDAR RAPIDS, IOWA
Midland Supply, Inc.
823 Rockford Rd., S.W.
CHARLOTTE, N. C.
Apex Machine Tool Supply, Inc.
3107 Wilkinson Blvd.
DALLAS, TEXAS
Tool Products Co., 147 Payne St.
DAVENPORT, IOWA
Midland Supply, Inc., Box 341
DENVER, COLORADO
Overgard Machine Tool Co.
2045 West 8th Avenue
HAMILTON, ONTARIO, CANADA
Higginson Engineering Sales
275 James North
HARRISBURG, PA.
Fidelity Tool Supply, Inc.
19th and Chestnut Sts.
KANSAS CITY, MO.
Elffoldt Machinery & Supply Co.
1219 McGee St.
MILWAUKEE, WISCONSIN
Tool and Die Supply Co.
647 W. Virginia Street
MINNEAPOLIS, MINN.
Northern Machinery & Supply Co.
2001-2009 Washington Ave., S.
NASHVILLE, TENN.
Ralph Landrum Tool and Die Supplies, 1107 Granada Ave.
ST. LOUIS, MO.
Scott Special Tools, Inc.
1252 N. Kingshighway
SEATTLE, WASH.
National Steel Sales, Inc.
1927 First Ave., South
TOLEDO, OHIO
Midwest Die Supply Company
1671 Fernwood Avenue
TULSA, OKLA.
Krisman Industrial Supply Co.
306-307-308 E. Fourth St.
WICHITA, KAN.
Elffoldt Machinery & Supply Co.
312 Laura St.

**EARLY JOB PLANNING** preceded production of the G-E J47 nozzle. Here, David Nelson, design engineer; Felix Scopelliti, production manager; William F. Steinen, president; and Ernest Tedesco, quality control director, discuss contract.

# Industry benefits as G-E defense subcontractor adapts new-found skills to peacetime production

## Co-operation on defense jobs between General Electric and small Newark business firm leads to new machine designs and techniques—now available to other industries

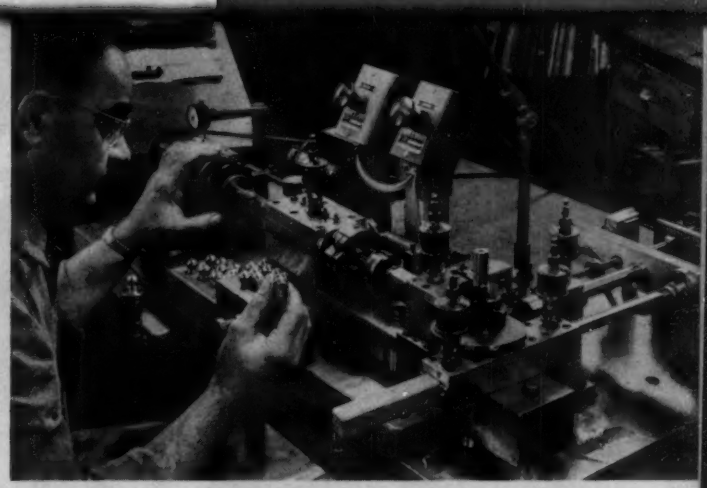
Since 1907, the William Steinen Manufacturing Company of Newark, New Jersey, had been growing slowly as a producer of screw machine parts and metal stampings. With the Korean War, however, defense subcontract orders from General Electric required swift production changes, and the small company responded with imagination and efficiency.

**One tremendous challenge** was the requirement of extremely close tolerances for G.E.'s J47 jet engine nozzle. To fulfill the requirement, Steinen hired more expert personnel, enlarged its engineering staff, designed new machines. Result: reduced unit cost, delivery on schedule, high quality, and more G-E contracts. At present Steinen is engineering and developing nozzles for even more advanced G-E engine projects.

**With growth came new abilities.** Exacting G-E contracts meant much more than a greatly increased employee roster and added machines. It meant the development of new skills, versatility, and capacity. And today—even though Steinen sales will hit an all-time high of $1,900,000 in 1955—less than 10% of this is defense work. The company has smoothly switched the bulk of its production to peacetime industrial needs.

**A proving ground for industrial production.** G-E defense contracts have helped many small businesses "grow up" to the American economy's expanding needs. In a climate of peace, these companies are adapting to the stretch-out of defense orders from the Korean peak, matching their new capacities and standards to the demands of industry—an excellent example of large and small business co-operating for mutual benefit. 649-4

**TRIPLED PRODUCTION** resulted from this Steinen-built machine which cross-drills three wiring holes in jet nozzle bodies at one time, instead of singly.



**ELIMINATING A SLOW HAND OPERATION,** and reducing costs, this machine was specifically designed by Steinen for precision reaming of holes in jet nozzles.

**MODERN PACKAGING** developed by Steinen utilizes clear plastic tube in which nozzle assemblies have high visibility, and are easily selected.

**SWIFT GROWTH** required expanded accounting and purchasing department. William Steinen, Sr., (in vest) founded company forty-eight years ago.

**VOLUME PRODUCTION** on short notice is possible at Steinen because a large variety of metal stocks is always on hand in company's storage areas.

**EXHAUSTIVE TESTING,** such as this test of nozzle's spray angle, enables Steinen to meet the rigid standards set by General Electric and other prime contractors.

## CAN SMALL BUSINESS HELP YOU?

Thousands of small businesses, like the William Steinen Mfg. Co., have furnished General Electric with practically every kind of skill and services as defense subcontractors and suppliers. Many of these companies have available production capacity, created in large part by the reduction of defense orders since the Korean War peak. This means that they may be able to apply their skills to help you with your production.

If you have a manufacturing problem or have work available for subcontracting, please write us on your letterhead stating in as much detail as possible the type of services or skills you require. We will be glad to suggest several small businesses who have done similar work for us and may be able to help you. Write to C. W. Bryant, Manufacturing Services Division, General Electric Co., 570 Lexington Ave., New York 22, New York.

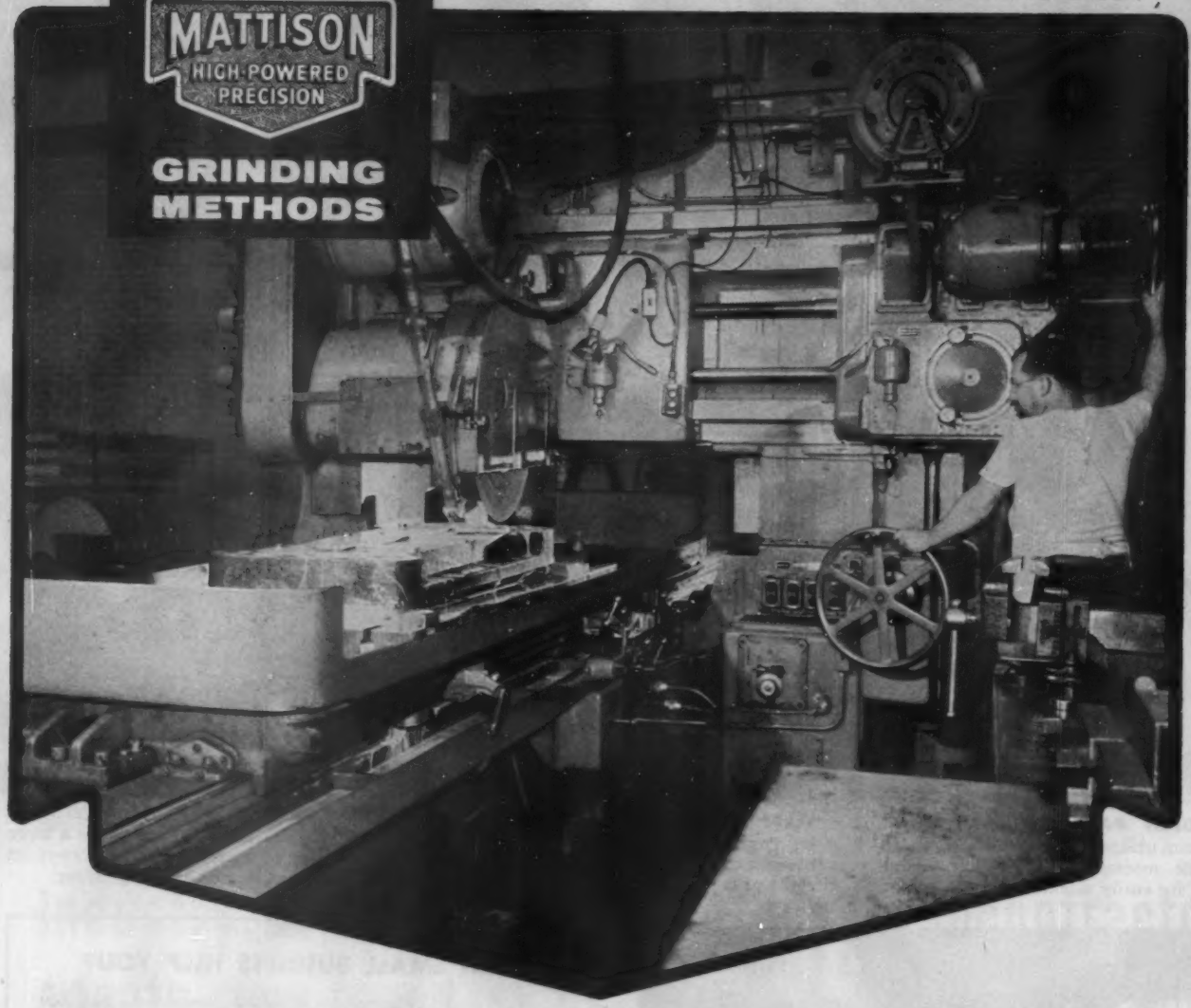
*Progress Is Our Most Important Product*

GENERAL ELECTRIC

CASE HISTORY NO. 9—H-C STEEL BLANKING DIES

MATTISON
HIGH-POWERED
PRECISION

# GRINDING METHODS



## Accuracy upgraded from .006 in. to .0003 in. sharpening large blanking dies on the "Plano"

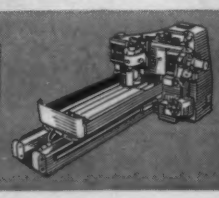
Operators set up male blanking die on Plano Grinder where it is ground with speed and precision.

Improved precision, rather than high production, was the primary goal of this user of a Mattison Plano Horizontal Spindle Surface Grinder. Yet, experience proved it possible to achieve both. One precision job ground on the machine is a male blanking die of high carbon, high chrome Ontario steel. Accuracy is maintained to .0003 in. compared to .006 in., which was the closest tolerance obtained on the previous equipment. Floor-to-floor time for grinding the die has been reduced from 3 hours to 1½ hours on the Plano. Improved finish is another notable benefit gained.

The Plano Grinder features massive, rugged construction and high horsepower characteristic of the entire Mattison line. It is unexcelled for grinding flat and "V" ways; long, narrow work; large, flat work; surface tables; plates; dies; jigs; and similar work.

Write for Bulletin No. 345 which describes this versatile, powerful grinder.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE GRINDERS

# your best bet... BSA single spindle automatic screw machines

## for fast, economical single spindle bar work up to 2" diameter

The 2" BSA Single. Note open operating area for ample chip clearance and tooling accessibility.

- BSA Tools Ltd. of England, one of the world's oldest and largest machine tool builders, have produced and distributed thousands of these BSA "Singles" since they introduced them in 1926.
- Available in five standard capacities: ½", ¾", 1", 1⅜", and 2".
- All models use STANDARD AMERICAN TOOLING.
- Wide range of spindle speeds —200 to 6000 on ½" machine, 69 to 1260 on 2" model.
- Cams, change gears and tooling easily accessible for quick job-to-job changeover.
- Unit construction provides quick access for easy maintenance.
- Special spindle mounting, designed to reduce wear.
- Cross slides and turret mounted on replaceable ways.
- Positive chain drive from gear box to spindle prevents slippage.

**distributed and serviced in U.S.A. by NATIONAL ACME**

Since their introduction in this country, BSA Single Spindle Automatic Screw Machines have enjoyed remarkable acceptance. Combining latest automatic screw machine principles with proven design, they have produced at top standards of speed and accuracy with minimum upkeep.

BSA "Singles" are distributed and serviced in the United States by National Acme, in Cleveland, where adequate replacement parts are stocked —and you get the same active, experienced and interested service support as that on which National Acme's reputation has been built.

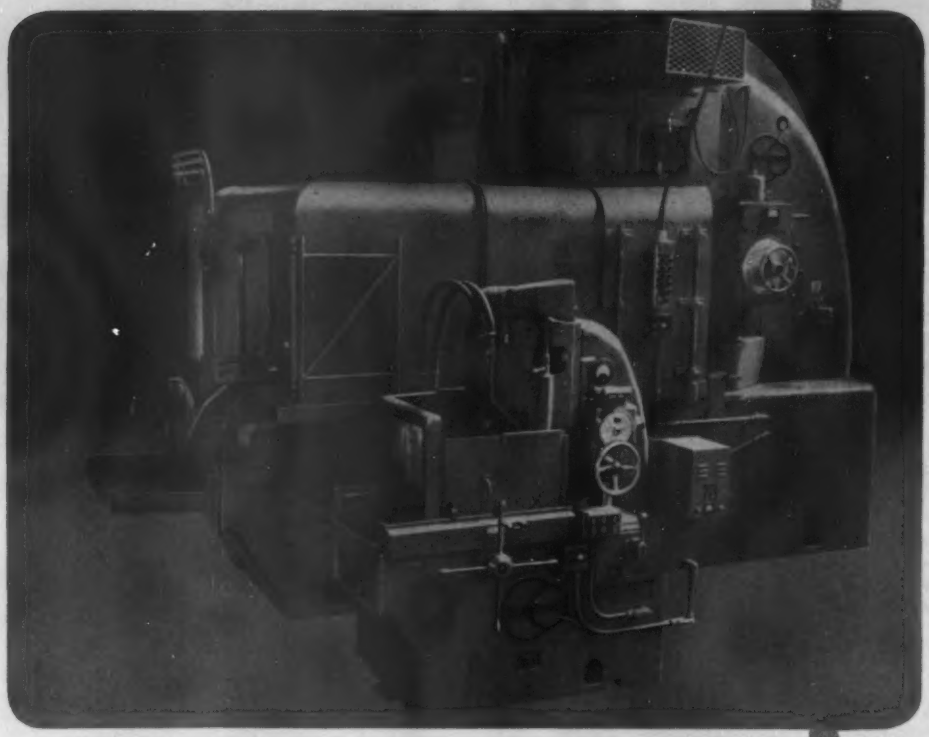
**For specifications on all sizes, write for Bulletin BSA-54**

OUR JOB: to provide the *Right Machine* for YOUR JOB

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

**THE NATIONAL ACME COMPANY**

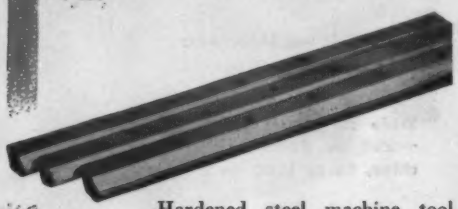
171 EAST 131st STREET • CLEVELAND 8, OHIO



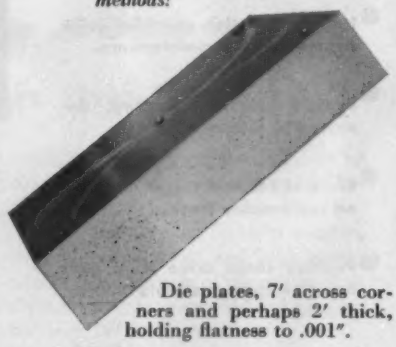
V-488

Tiny watch gears, pinions and ruby bearings — flat and parallel — to a dimension tolerance of .0002″.

To 3 micro-inches and flat within *one* light band.



Hardened steel machine tool ways, 2½″ x 3½″ x 50″, ground on 6 sides, flat within .001″ with surface finish of 5 micro-inches — *5 times faster than other methods!*



Die plates, 7′ across corners and perhaps 2′ thick, holding flatness to .001″.

# *Please* give us a chance!

We *know* we can do *your* flat surface jobs. We've done them all — tiny watch parts . . . steel plates 7 feet across corners . . . copper and ceramics . . . *perfectly*. Just give us the correct wheel . . . (Blanchard wheels are preferable).

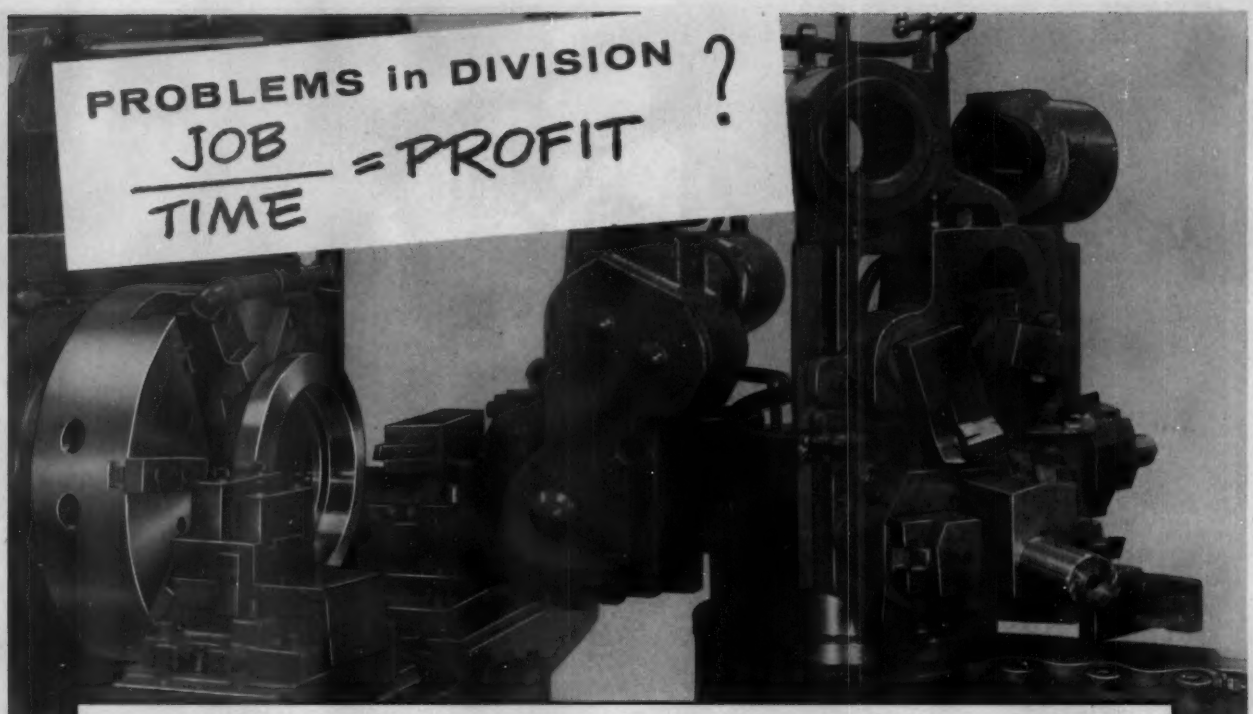
Blanchards regularly grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001″, with dimension tolerance of .0002″ and surface finish to better than 3 micro-inches.

Honest, we Blanchards (15 models) work fast and inexpensively — whether the job requires precision grinding or rapid removal of stock. Give us a chance to prove we're the best investment you ever made.

Send for free copies of "Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.




# POTTER & JOHNSTON

## has the answers! *for example:*

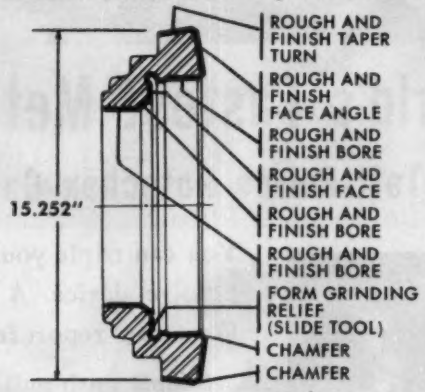
**ONE OPERATION . . . Machining Time 6.74 Minutes**

### THE PROBLEM

BEVEL DRIVE GEAR
4629 STEEL FORGING
14 SEPARATE, CLOSE-TOLERANCE CUTS REQUIRED

### THE ANSWER

FINISHED IN JUST 6.74 MINUTES
ON A P&J 6DREL-40 AUTOMATIC
with P&J-ENGINEERED TOOLING!




*HEAVY LINES INDICATE MACHINED SURFACES*

It's obvious, mathematically, that reducing the divisor in our formula will produce a bigger quotient . . . *your profit!* And it is equally obvious, from a practical point of view, that you can't solve *today's* machining problems profitably on machines built for yesterday's jobs. Here's a formula for profit proved in practice by dozens of manufacturers:

Modernize now with a P&J Automatic . . . like the 6DREL-40 . . . that has the speed, power and versatility to meet today's demands for faster, more accurate, lower-cost production. Team it with P&J-Engineered Tooling that takes full advantage of combined cuts and faster-cutting carbide tooling to reduce machining time to a minimum.

Start now . . . write on your Company letterhead for your copy of Bulletin No. 159 fully describing the P&J 6DREL-40 and 6DRE-40, and including complete engineering data.

*Precision Production Tooling for more than Fifty Years*

## POTTER & JOHNSTON COMPANY

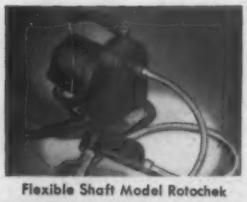
PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INCORPORATED

MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT

# World's Fastest Method of Gaging Threads

## Taft-Peirce Rotochek Gages Threads 3 Times Faster



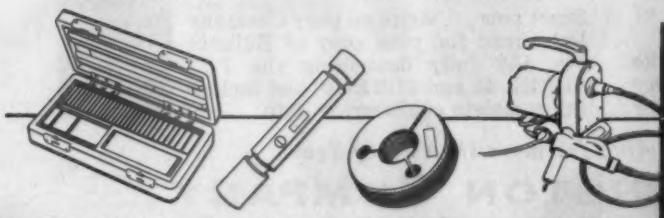
Flexible Shaft Model Rotochek

Bench Model Rotochek

You can triple your thread inspection rate with this simple, inexpensive device. A Rotochek is fast . . . accurate . . . easy to use. Operators report from 3 to 4 times as many parts inspected daily.

Simply push-pull and the part is inspected. Bring the part to the Rotochek, or the Rotochek to the part—a slight push and gage screws into the work. Release the pressure and the gage stops. Pull—and it disengages.

Available in bench model, or with gaging head on flexible shaft. Adaptors permit use of reversible thread members and ring gages. Send for bulletin with full description and prices.



Gage Blocks Plain Gages Thread Gages Rotochek

*T-P means Top Precision*

T P

**THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.**

Whatever kind of gears you make...
Whatever way you make them

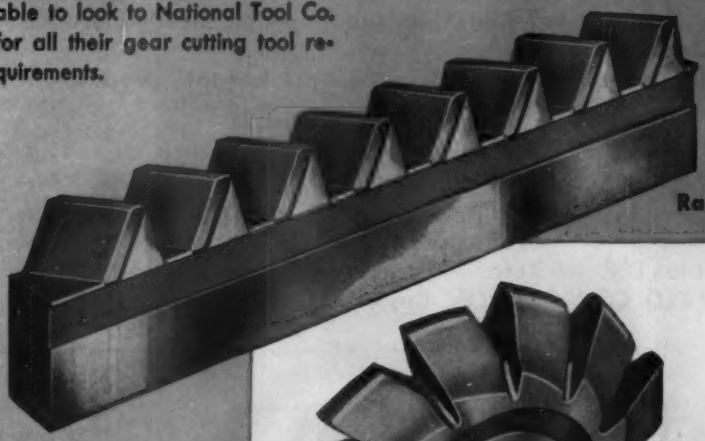
# National Tool Co.

can supply the right type cutting tool
because we make *all* types

Gear Shaving Cutters

Hobs

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.



Rack Type Gear Shaper Cutters

Gear Shaper Cutters

Involute Gear Cutters

Master Gears

Herringbone Gear Cutters

1905 - 1955 Our 50th Year

National
TOOL CO.
Cleveland 2, Ohio

Representatives in major industrial centers

Adjustable

Three-Point

# SHEFFIELD

## *Adjustable* AIR GAGE TOOLING for Short Runs and Emergencies

**SUCH AS:**

- **Aircraft manufacturers, subcontractors and job shops having limited production.**
- **Accidental damage to a vitally needed single purpose gage.**
- **An unexpected engineering change involving part size.**
- **A short run of special parts for which no gages have been provided.**
- **A mistake or failure in ordering the needed single purpose gages.**
- **Sudden need for process gages at the production machines.**

Don't let any of these situations cause costly scrap, delays or embarrassing confusion in inspection, in the shop or in the toolroom. A small investment in the tooling here illustrated is your best insurance against unpredictable production losses.

Write Div. 600 for descriptive engineering data. ***THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.***

### Economical, Adjustable Balljet Spindle Kit

**In 5 minutes you can assemble, for precision gaging, a spindle for ANY SIZE hole from 1" to 3" in diameter.**

**Consider economy for a moment. If the holes you may encounter vary in increments of .001", this Kit provides the equivalent of 2000 Spindles at a unit cost of less than a dollar. If those increments are .0001" you have available 20,000 Spindles at about a dime each. That is real economy.**

**No auxiliary equipment needed except conventional gage blocks—NOT EVEN ONE MASTER SETTING RING.**

Balljet Spindle assembled

Balljet Spindle in use

Calibrating Fixture

Adjustable Balljet Spindle Kit

Representatives in major industrial centers

Cleveland 2, Ohio

## Adjustable Airebore Gage

Adjustable Airebore Gage

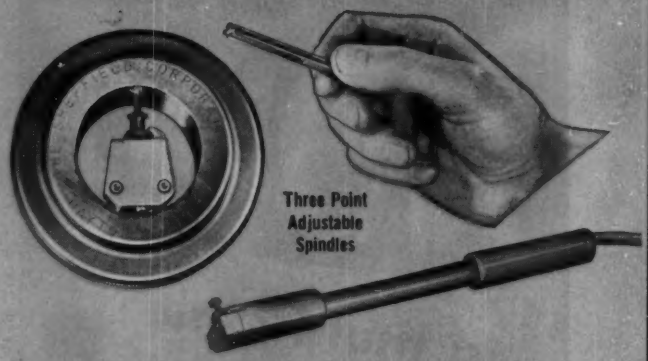
Airebore Gage in use

Airebore Gage assembled

The Airebore Gage can be set precisely to measure any diameter hole from 3″ to 12″. And like the Adjustable Balljet Spindle, it is set up with a calibrator and gage blocks. No master setting rings are needed.

The Airebore Gage is self-centering—needs only to be rocked in place for precision action. It is light in weight with all contact surfaces of tungsten carbide—nothing to wear out.

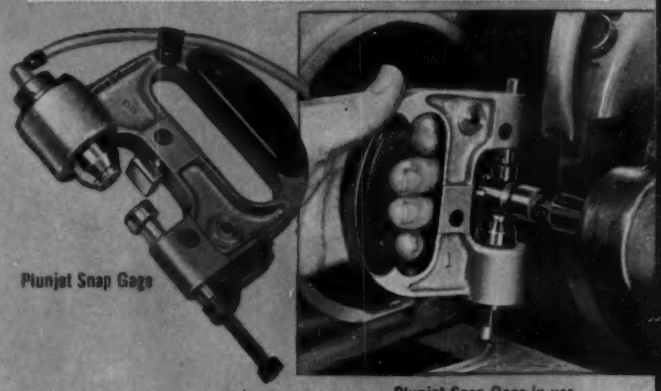
## Three-Point Adjustable Spindles



Three Point Adjustable Spindles

The Three-Point Adjustable Spindles, four of them, cover respectively the ranges, ⅜″ to 9/16″, 9/16″ to 1″, ⅞″ to 1½″ and 1½″ to 3″. They can be set up with gage blocks.

## Plunjet Indicator Snap Gage



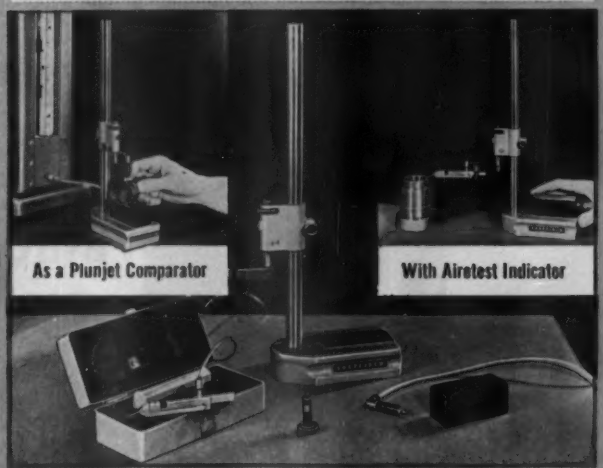
Plunjet Snap Gage

Plunjet Snap Gage in use

The Plunjet Gaging Cartridge may be substituted for the Dial Indicator to assure consistent, repetitive readings, especially when tolerances are .001″ or less.

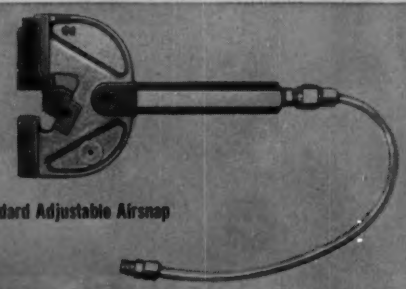
Twelve Plunjet Snap Gage models cover the gaging range of 0″ to 12″. Larger sizes are available on special order.

## Airetest and Plunjet Stand




A new, highly versatile stand accommodates a dial indicator or an Airetest Indicator—also converts to a comparator by using a Plunjet and anvil as illustrated.

## Standard Adjustable Airsnaps



Standard Adjustable Airsnap

The Standard Adjustable Airsnap in 17 models covers the range .2500″ to 5.500″. Up to 3.000″ the adjustable anvil has a maximum adjustment of ¼″. Above that the maximum is ½″.

SHEFFIELD MEASUREMENT HEADQUARTERS

SHEFFIELD

MANUFACTURE AND MEASUREMENT FOR MANKIND

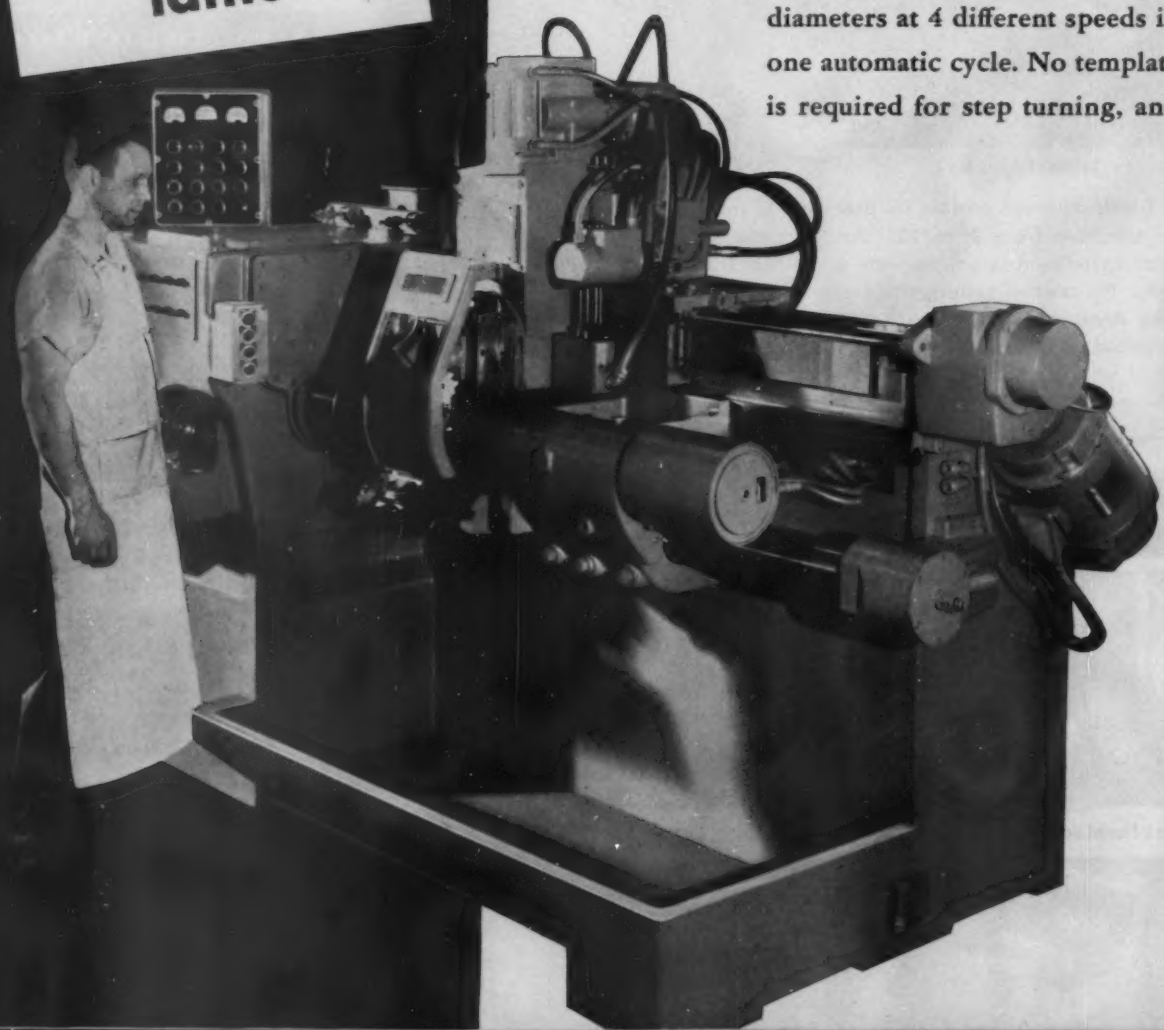
7220

Ballject Spindle assembled

Calibrating Fixture

# NOW!

## a multi-cycle single point production lathe



## ...designed for *quick* set-ups to handle small lots

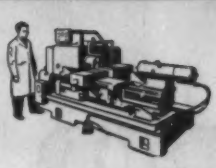
This Sundstrand 40 HP single point turning lathe provides a ruff and semi-finish cut with ruffing tool and finish cut with finishing tool *all in one automatic cycle.* This is a mechanically operated machine with front carriage and shoulder facing tools actuated independently. Three cuts, as described, can be taken on each of 8 diameters at 4 different speeds in one automatic cycle. No template is required for step turning, and

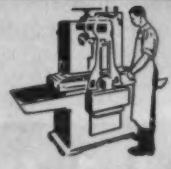
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

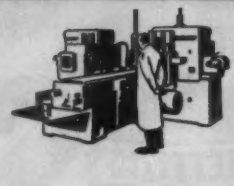
SUNDSTRAND

50 YEARS OF *"Engineered Production" Service**

*REG. U.S. PAT. OFF







micrometer adjustment for steps is easy to set for size corrections due to material changes, etc. There is no lost motion for re-set because index takes place during cut.

Machine is provided with a transmission type head with automatic speed changes to maintain correct speeds and maximum horsepower. Feeds are infinitely variable, from 7½ to 300 inches per minute.

## ✓Check these 7 important advantages

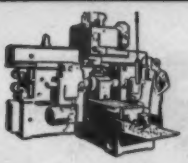
1. Easy tool maintenance.
2. No matching of cuts.
3. Fast set-up.
4. Uniform stock removal for subsequent grinding or finishing operations.
5. Ruff and finish automatic cycle for possible elimination of green grinding.
6. No waiting for special tooling to complete small lots.
7. No tooling inventory for small lot runs.

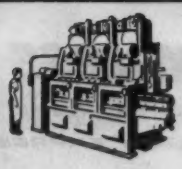
This same machine can be furnished with punch card control. With this system, decimal dimensions on engineering drawings are punched in standard business machine cards with a standard key punch. The cards are then fed into a reader, as shown above, which feeds the electrical signals into a machine control unit. This unit then controls all functions of the machine.

## Additional Data . . . . . .

. . . on both types of machines is available. Write for copies today. Ask for bulletin 162.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





**SUNDSTRAND**
**Machine Tool Co.**
2533 Eleventh St. • Rockford, Ill., U.S.A.

John O. Gantner, Jr., President of Gantner of California, reveals why

# "She always has the last word!"

"They say a woman will always have the last word. It's certainly true when she shops for a swimming suit!

"She waits till the last possible minute, and insists she get the 'last word' in style. Pressure on stores is terrific. If 'hot' styles run out of stock, those sales are gone forever.

"But our retail accounts know they can depend on Gantner.

"Gantner styles can be restocked to any store in the country in a few hours, *while the ads are running*. Not a moment is lost — not a sale is lost — thanks to Air Express!

"And one last word — about costs. Specifying Air Express can save you money, too. 15 lbs. from San Francisco to Chicago, for example, costs $10.91. That's $1.09 less than any other complete air service!"

**Air Express**

**GETS THERE FIRST** *via U.S. Scheduled Airlines*

**CALL AIR EXPRESS . . .** *division of* **RAILWAY EXPRESS AGENCY**

The "see-through" safety guard was specially made for this photo only.

Distinctive RED blotter on a new WHITE wheel is the sign of COOL tool grinding worth cheering about! And that's not all...V40 Bond Tool Room Wheels by CARBORUNDUM cut faster, last longer and permit heavier infeeds without burning the stock or overheating the tool, even on die steels and hi-vanadium types. And the outstanding form-holding ability of V40 Bond Wheels eliminates costly stops for wheel dressing halfway through a job. Try one in your shop today. There's a type for every tool room operation...easily identified by the V40 on the bright red blotter. Your CARBORUNDUM Distributor or salesman will arrange a free demonstration. For Bulletin A-1310, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

**Through product quality and application "know-how"**

# CARBORUNDUM

REGISTERED TRADE MARK

**continually puts more sense in your abrasive dollar**

## All work and some play makes this a smart buy

6,000-r.p.m. wheel speed is "stopped" by 1/10,000 sec. stroboscopic exposure. (The "see-through" safety guard was specially made for this photo only.)

Here's the perfect answer to all rough grinding problems. CARBOFLEX Depressed Center Wheels, with resilient fibre-reinforced construction, combine maximum cutting ability with maximum operator safety. Reduce or undercut heavy welds, clean up castings, rough off fins and sharp risers... in record time, at less abrasive cost per wheel. CARBOFLEX Wheels are tops for cutting-off and slotting, too! Another outstanding feature: the back of the wheel, like its face, is knurled. You can cut with either side, plus the edge... without initial dressing. Call your CARBORUNDUM Distributor or salesman today for a demonstration of this rugged production booster. For descriptive folder A-1272, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Co., Ltd., Niagara Falls, Ontario.

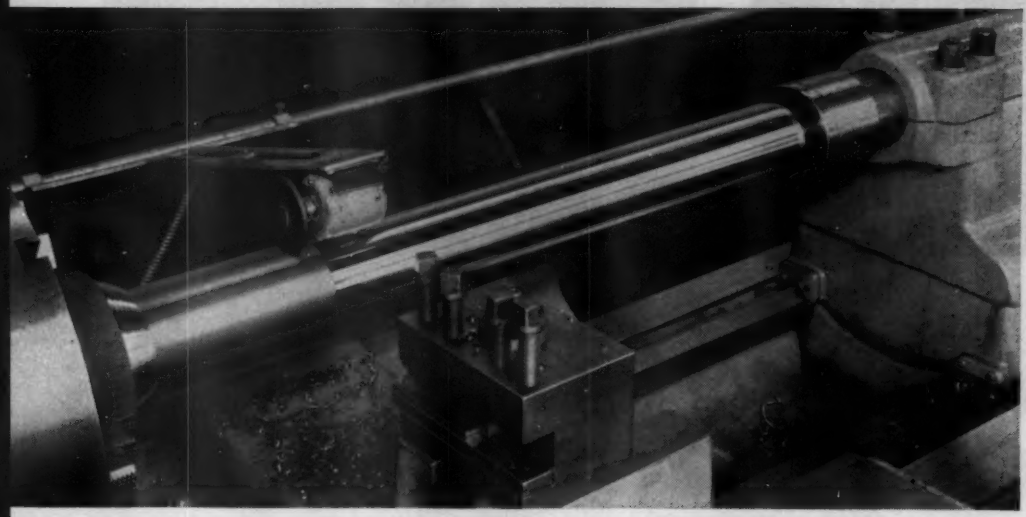
**Through application "know-how" and product quality**

# CARBORUNDUM

REGISTERED TRADE MARK

**continually puts more sense in your abrasive dollar**

Normal speed for finishing this AISI 1045 shaft with carbide is 500 sfpm. (See tachometer above.) Only 7.4 cubic inches are removed in 2 minutes with .010" feed, 1/16" depth of cut.



With Carboloy Cemented Oxide, speed increased to 2000 sfpm, and 29.6 cubic inches were removed in the same time, under identical cutting conditions.

Limited offering available January 1 . . .

# FINISH STEEL AT SPEEDS UP TO 7500 SFPM WITH NEW CARBOLOY CEMENTED OXIDE TOOLS

Carboloy® Cemented Oxide is an entirely new kind of cutting material, specially developed for steel finishing at speeds ranging from 300 to 7500 sfpm.

To date, Cemented Oxide tools have been used to cut steel with Brinell readings up to 300. Results have included more metal removed per minute, with finishes superior to those possible with carbide or HSS.

### Tip stays cool

Performance evaluations at the Carboloy machinability laboratory and in customer plants prove Cemented Oxide cuts cleanly, resists edge wear and cratering. Even at extremely high operating speeds, the tip remains so cool it can be touched immediately after the cut.

Preliminary reports show Cemented Oxide can also improve efficiency of relatively low-speed equipment. Because this material provides longer tool life at higher speeds, output increases and cutting time is reduced.

### Takes up where carbides leave off

Carboloy Cemented Oxide is not a typical ceramic or cermet. It is stronger and more resistant to chipping than typical ceramics. Four years in development, Cemented Oxide takes up where carbides leave off on high-speed steel finishing.

To aid full-scale commercial evaluation of Carboloy Cemented Oxide, a limited number of sizes and shapes will be available January 1. For the preliminary technical bulletin, send the coupon on page 8 of this advertisement.

**CARBOLOY**
DEPARTMENT OF GENERAL ELECTRIC COMPANY

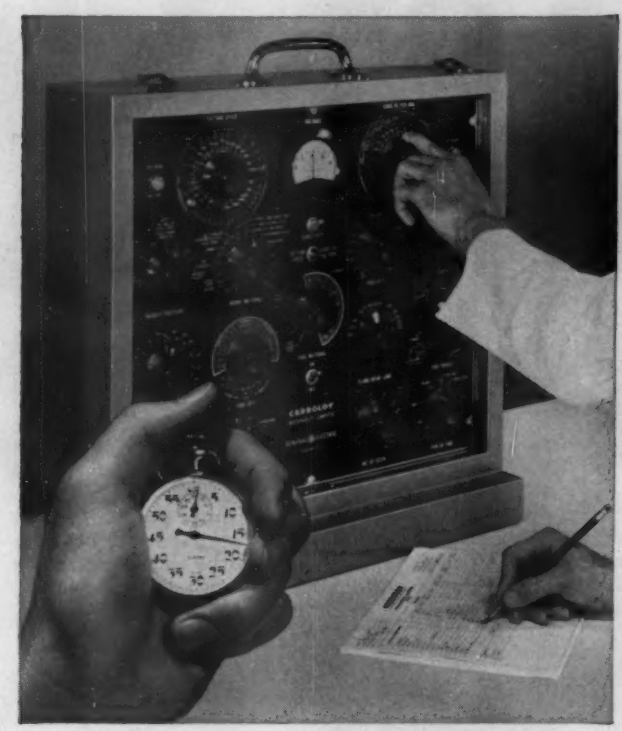
# SOLVE MACHINING PROBLEMS IN SECONDS

The Carboloy Machinability Computer can determine the most efficient values for any of these 19 basic operating variables:

**Material to be cut:** Work material, microstructure, hardness, surface condition.

**Cutting tool:** Tool material, tool life, flank wear land, tool profile, type of tool, number of teeth.

**Cutting conditions:** Cutting fluids, feed, depth of cut, cutting speed, motor horsepower, cubic inches per minute, unit horsepower, work diameter, R.P.M.



Set dials for the values of each of the known variables. (Time: 1—2 minutes.)

Turn dial of unknown variable until meter balances at zero setting. (Time: 10—15 secs.)

Read the answer directly off the dial. No computations are necessary. (Time: 10 secs.)

# WITH CARBOLOY MACHINABILITY COMPUTER

- **Calculate production, tool life, horsepower, or any of 16 other basic machining variables**
- **Eliminate wasteful tryout runs, improve existing setups**

The Carboloy Machinability Computer is a new engineering tool designed to solve complex machine setup problems in seconds, instead of hours.

It calculates the effect of the 19 most critical machining variables on the material to be cut, the cutting tool, and the cutting conditions . . . shows how to set up optimum operating conditions for any metal-cutting job, and how to improve existing setups by the right variation of operating conditions.

### For production men, methods men, etc.

The Computer assists production men by determining rate of metal removal, and by immediately showing how production is affected by changes in feed, speed, depth of cut, tool material, and other key variables.

The Computer eliminates wasteful, nonproductive trial runs, saving valuable stock and setup time. It also determines machine output for methods men, pieces per hour for estimators, and it answers other problems pertaining to machining . . . providing accurate solutions in seconds for problems that normally take hours for even approximate answers.

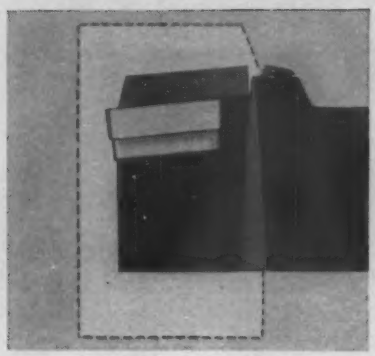
### Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

The computer is portable (weighs only 32 lbs.), battery-operated, and measures 21″ x 7″ x 20″. The price of the computer is $495, f.o.b. factory, Detroit.

Whether your plant is large or small, the Carboloy Machinability Computer can pay for itself by increasing production, reducing manpower costs. Send the coupon on page 8 of this advertisement for full details. If you request it, we will arrange a demonstration in your plant.

**CARBOLOY**
DEPARTMENT OF GENERAL ELECTRIC COMPANY



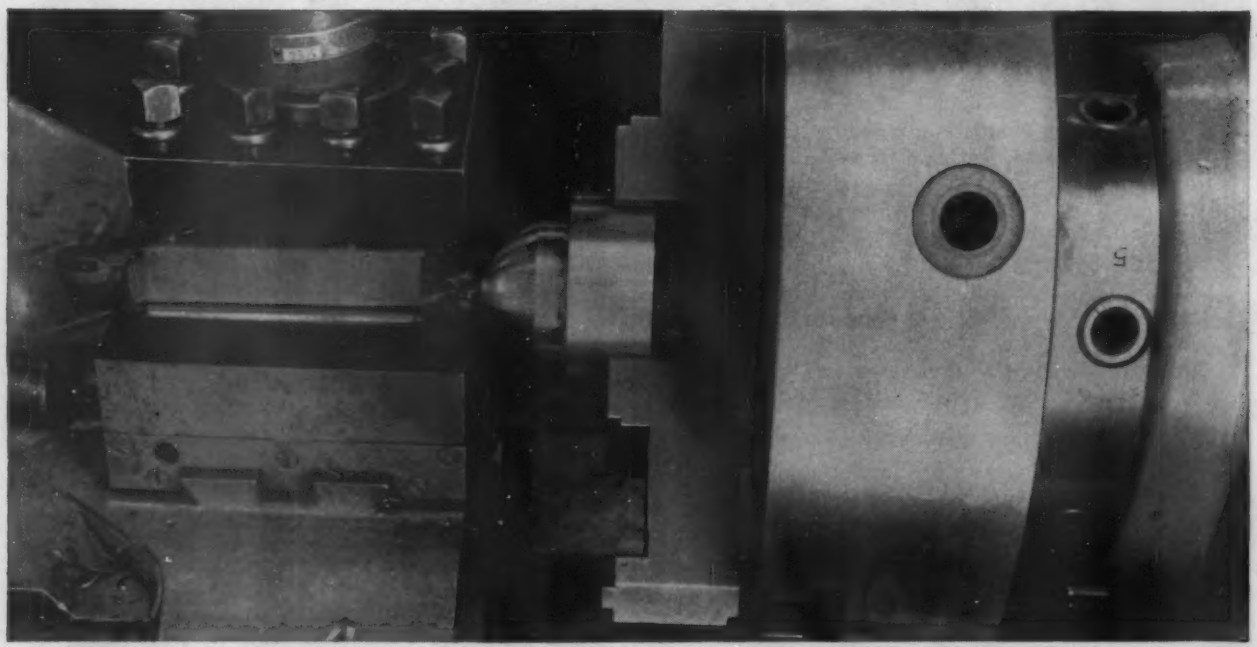
**New design** eliminates "club" below shank; reduces overhang to absolute minimum. Indexing is fast, simple . . . accuracy is increased.

**Clamp** has built-in, wear-resistant carbide chipbreaker. Requires only light finger pressure to tighten; assures uniform chips on any cut.

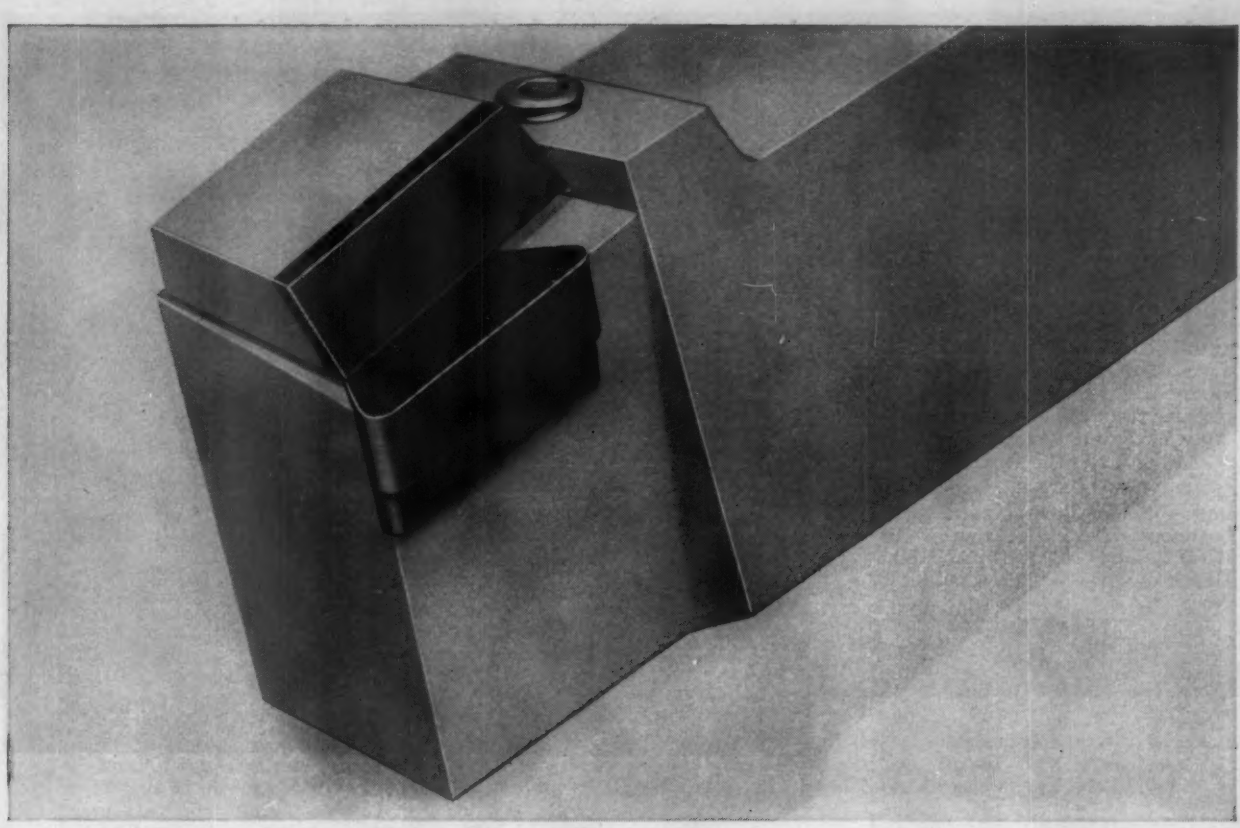
**Indexable carbide pad** is screwed to shank. Stays put while blank is indexed. Absorbs shock; decreases the possibility of holder damage.

Because they combine four basic design improvements . . .

# NEW CARBOLOY TOOLHOLDERS ARE EASIER



**Contouring Stellite valve.** Round Carboloy cemented carbide insert is furnished precision-ground, eliminating costly grinding operation required for braze-type tools. Inserts on new Carboloy toolholder are indexed or turned over right in the machine . . . reducing downtime. With Carboloy holders, only inserts are stocked . . . saving valuable toolroom space.



# TO USE . . . STRONG, SIMPLE, AND ACCURATE

- **Single screw indexes insert; automatically sets chipbreaker**
- **Carbide pad absorbs shocks; cuts throw-away insert costs**
- **New design reduces overhang; improves tool accuracy**
- **Heat-treated shanks resist bending and deformation**

Simply adjust a single screw at the top of the shank, and the cutting blank can be indexed or turned over while the Carboloy holder stays in the machine. The carbide chipbreaker is set automatically in the correct position.

**Carbide pad cuts insert costs**

Because the carbide pad absorbs shocks and gives greater rigidity, thinner, harder, more economical cutting blanks can be used. Machines operate at greater speeds and feeds; increase output at reduced cost.

Carboloy design eliminates projections below the shank . . . reduces overhang, increases accuracy and rigidity. Minimum projection above the shank stops chip interference, protects clamp from abrasive chips.

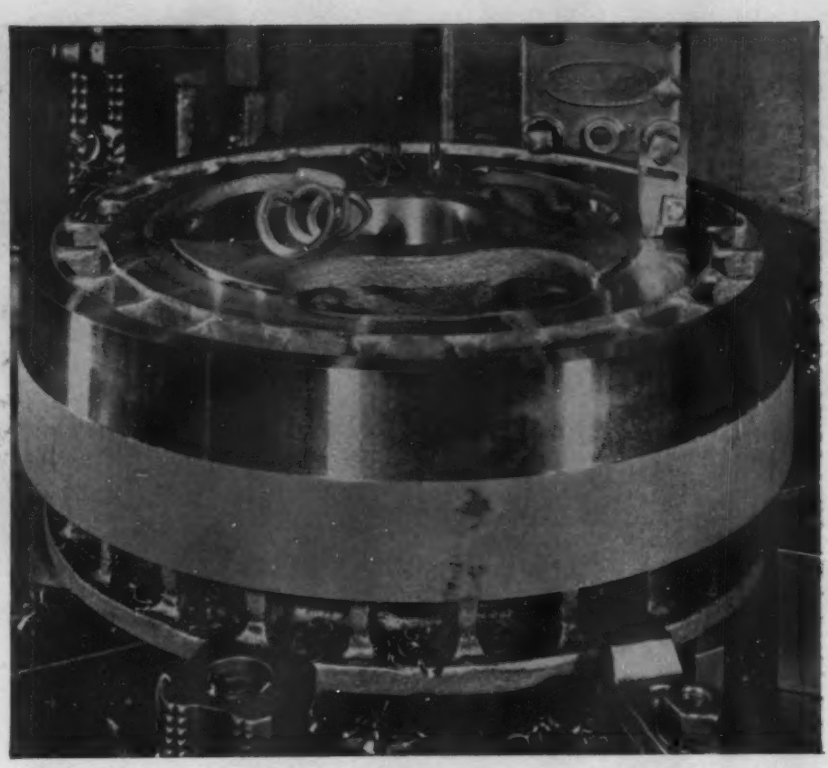
Heat-treated shanks give the holders extra strength to resist clamp-screw deformation and chip wear.

**Handle special jobs with ease**

The Carboloy holder design is quickly adaptable to "specials" with cutting angles other than standard, and to positive or neutral rakes. New, compact design makes them especially efficient for gang tooling.

Available for round, square, or triangular blanks, the Carboloy holders are stocked in seven styles and 52 sizes. New, heavy-duty holders are also available. For prices and specifications, send in the coupon on page 8 of this advertisement.

**CARBOLOY**
DEPARTMENT OF GENERAL ELECTRIC COMPANY

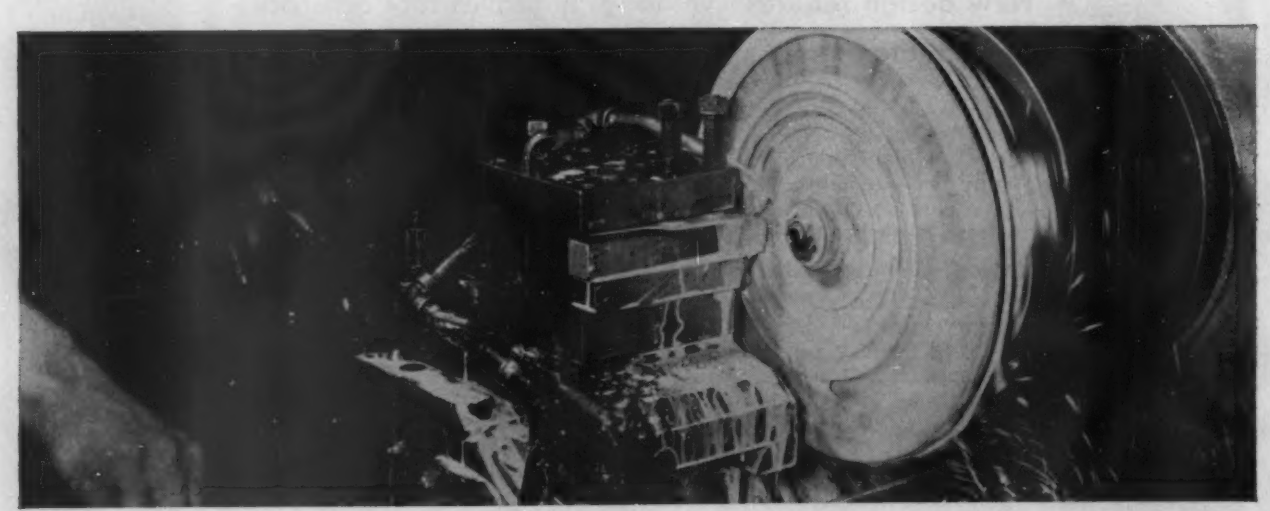


**FACING POWER-SHOVEL CLUTCH AND BRAKE DRUM.** It took as many as 16 of the former carbide tools, on a 42-inch Bullard, to make a *single* cut through multiple sand inclusions and heavy interruptions. A Grade 370 tool took *nine* cuts without any appreciable wear. Because the Grade 370 tool outlasted 144 of the previous tools, over-all machining costs were cut almost 70%, downtime costs were reduced from $60 to $1, and grinding was completely eliminated.

**SETUP: Material**—1045 low carbon, high manganese cast steel, with hardness of 27 $R_c$. **Speed**—24 RPM. **Feed**—0.018-0.033 inch. **Depth of cut**—⅜ inch. **Coolant**—No.

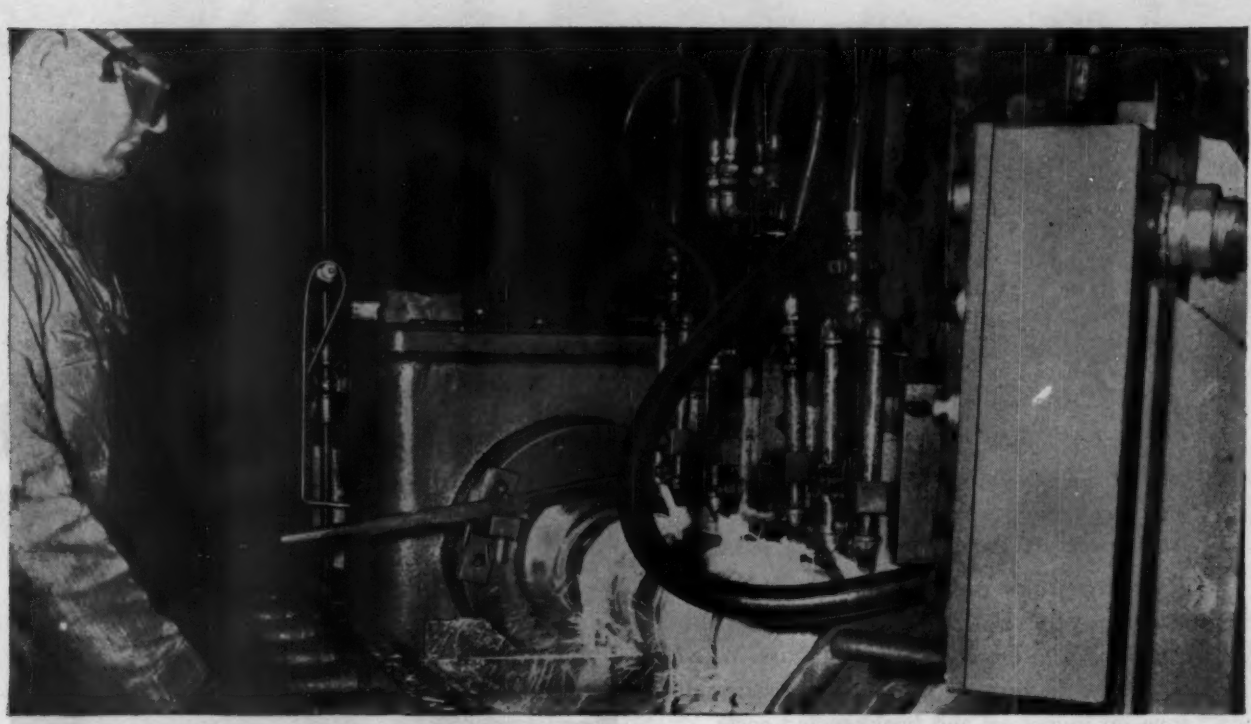
Hundreds of in-plant case histories prove . . .

# CARBOLOY GRADES 350 AND 370 CUT FASTER,



**FACING TURBINE WHEEL BUCKET.** It took 60 carbide tools, making two separate cuts, to get daily production of 25 units at Kelsey-Hayes Wheel Co. By switching to Grade 370, the two-cut operation was compressed into one, the number of tools required was reduced two thirds, and production was almost doubled.

**SETUP: Material**—Inconel, heat-treated to 18 $R_c$, welded to rim of Stellite. **Speed**—125 sfpm. **Feed**—0.0155 inch. **Depth of cut**—⅜ inch. **Coolant**—Yes.



**TURNING 8-INCH STEEL SHELL.** Grade 350 increased production runs on these forged and extruded shells between 15 and 20 pieces per grind. At toughest stage of rough-turning operation, Grade 350 processed 4 times as many shells as other carbides.

**SETUP:** **Material** – 1045 steel with varying heat analysis. **Speed** – 302 sfpm. **Feed** – 0.044 inch. **Depth of cut** – 3/16 to 7/16 inch. **Coolant** – No.

# WEAR LONGER, GREATLY INCREASE OUTPUT

**▶ Outperform all other steel-cutting carbides**

**▶ Take heavier, deeper cuts without deformation**

The machining records in plant after plant show Carboloy Grades 350 and 370 are capable of increasing output up to 300% over previous carbides used.

Not only do these grades outperform conventional carbides at higher speeds and feeds, but they outwear them on the toughest jobs – in some instances by margins as high as 144 to 1. (See case history above at left.)

### Built-in structural rigidity

Carboloy Grades 350 and 370 are extra-performance carbides. Their superiority is due to the greater structural rigidity built-in by the Carboloy manufacturing process.

This process enables them to take deep, punishing cuts without the chipping, cracking, or cratering encountered in other carbides . . . even at temperatures as high as 1800° F.

### No "equivalent grades"

Try heavy-duty Grade 370 and medium-duty Grade 350 in your own plant . . . compare them with regular tools on your toughest jobs. You'll quickly see why there are no "equivalent grades" to Carboloy 350 and 370.

Your local Authorized Carboloy Distributor stocks a complete line of Grade 350 and 370 tools, blanks, and inserts. Contact him today; or for more information on these extra-performance carbides, send in the coupon on page 8 of this advertisement.

**CARBOLOY**
DEPARTMENT OF GENERAL ELECTRIC COMPANY

Fill all your tooling needs
from a single, local source...

# 135 AUTHORIZED DISTRIBUTORS STOCK COMPLETE CARBOLOY LINE

Whether you're machining steel, cast iron, nonferrous metals, or plastics, you can depend on immediate delivery of the tools, blanks, and holders you need from your local Authorized Carboloy Distributor.

When you use your Carboloy Distributor's stocks as your own, you'll put valuable stockroom space to more advantageous use. When you order from a single, local source, you'll save on inventory and bookkeeping costs.

And call in your Distributor on machining problems. He is specially trained at the Carboloy factory to recommend the best carbide grade and tooling system for the job.

For the name of your local Authorized Carboloy Distributor, see the Yellow Pages of your phone book. He's listed under the Carboloy trademark heading in the "TOOLS" or "TOOLMAKERS" classification. Or, write to us for the name and address of the distributor in your area.

For more information on the Carboloy products described on the preceding pages, send the coupon today.

Carboloy Distributors provide immediate delivery on all standard Carboloy tools, blanks, inserts, and toolholders.

**CARBOLOY**

DEPARTMENT OF GENERAL ELECTRIC COMPANY
11149 E. 8 Mile Street, Detroit 32, Michigan

Send me information on the following Carboloy products:

- ☐ Carboloy Cemented Oxides (preliminary data)
- ☐ Carboloy Machinability Computer
- ☐ Have a representative call to demonstrate the Computer
- ☐ Carboloy Toolholders
- ☐ Grades 350 and 370 steel-cutting carbides
- ☐ Send me the name of the nearest Authorized Carboloy Distributor

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

**Carboloy Created-Metals for Industrial Progress**

# *Announcing* VK MICROGAGES

## .000008" ACCURACY

**81-BLOCK SET**
**$250.00**

# 30% *more wear surface than rectangular blocks*

Two really new and important facts should be noted in this announcement by Van Keuren: the closer tolerance of ±.000008" on VK Microgages, and the 81-block combination of ⅞" diameter longer-wear gages . . . now available for the first time.

These fine quality precision gage blocks by Van Keuren are products of the same machine-lapping and inspection techniques as Van Keuren Rectangular and Solid Square gage blocks. Size tolerance as already noted is guaranteed, as well as a maximum surface roughness of 1.4 RMS. Because their round shape provides greater wear surface, Van Keuren Microgages can be depended on for longer life and lower cost. Their closer tolerance has been particularly developed to meet today's demands for more exacting precision in shop work.

In addition to the new 81-block closer tolerance set featured here, Van Keuren offers 15 other standard sets of Microgages; also Solid Square type sets of gage blocks in .000004" accuracy and Rectangular type sets in .000004" and .000008" accuracy. For further information address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

***Ask for a copy of the new 258-page Van Keuren Catalog No. 36.***

***"Quality in Millionths"***

VK

36th YEAR

THE *Van Keuren* CO.,

**173 WALTHAM STREET, WATERTOWN, MASS.**

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

# people at the machine

# tool show compared

## ...AND SAW WHY

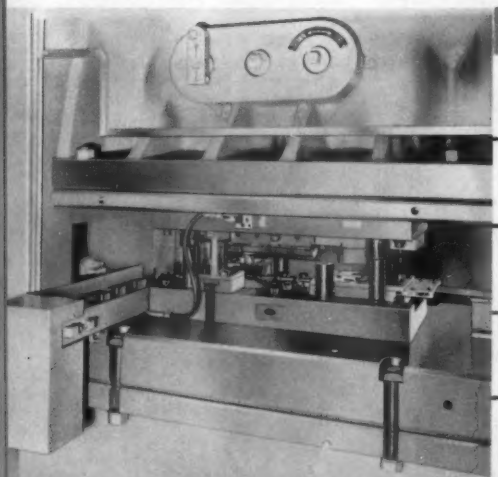
## IT COSTS LESS TO RUN A DANLY PRESS

Manufacturers, engineers, machine tool users and industrial leaders from all parts of the world watched Danly Presses and equipment operate at the Machine Tool Show in Chicago. They saw working demonstrations of Danly operational features . . . inspected advanced Danly design and construction . . . found out first-hand *why* increased production costs less with Danly Presses.

The Danly Autofeed Press exhibited represents the most advanced thinking in high-speed stamping press design . . . duplicating the actual results *you* can expect in your own plant. Vibration-resistant construction, built-in press controls, operator and press safety devices built into this press result in direct savings in maintenance and operating costs. Machine tool precision and substantially heavier construction throughout are basic reasons why Danly Autofeed Presses will give you greater production from your progressive dies . . . why this exhibition press turned out stampings from a seven station die at the rate of over 3,000,000 per month. This figure represents the number of rifle clips actually being produced, month after month, in a production plant from an identical die on a similar Autofeed Press.

These same Danly advantages will produce substantial savings in your operations. Use the comparison list shown here to check Danly Presses, feature for feature, against all other presses. *Discover for yourself why Danly Presses mean* increased production at lower operating costs. Talk to a Danly engineer *soon. Write for the completely new Danly Autofeed Press Catalog now!*

### WHY DON'T YOU COMPARE DANLY PRESSES, FEATURE FOR FEATURE, WITH ALL OTHER PRESSES ON THE MARKET?



THIS IS THE SEVEN STAGE PROGRESSIVE DIE THAT PRODUCES RIFLE CLIPS AT THE RATE OF OVER 3,000,000 A MONTH. EXTREMELY CLOSE ALIGNMENT OF OIL LUBRICATED SLIDE GIBS AND EXTRA-RIGID CONSTRUCTION OF DANLY PRESSES PROTECT DIES SUCH AS THIS. ASSURING LONGER LIFE.

| COMPARE | FEATURE | DANLY | OTHER | |
|---|---|---|---|---|
| PRECISION | Machine tool precision in manufacture and assembly plus adequate lubrication assure smoother operation, longer life. | ✓ | | |
| INSTALLATION COSTS | Danly presses are delivered already "run-in" tested. Assembly and operation in the Danly plant means fewer adjustments, faster installation. | ✓ | | |
| DRIVE | Danly's cool-running clutch lasts longer. Herringbone type gears and anti-friction bearings on high speed shafts wear longer. | ✓ | | |
| CONSTRUCTION | Extra-heavy construction reduces vibration and deflection. Dies last longer, presses stand up under severest duty. | ✓ | | |
| LUBRICATION | Danly features completely automatic oil lubrication including slide gibs. Should any vital bearing not be sufficiently lubricated, safety switch stops press and indicates the source of trouble. | ✓ | | |
| MAINTENANCE | Performance records in the country's biggest stamping shops prove that Danly Presses require less maintenance, greatly reduce spare part needs. | ✓ | | |
| CONTROLS | Controls designed and built by the press manufacturer assure the user of undivided, one-source responsibility for control and press performance on the production line. | ✓ | | |

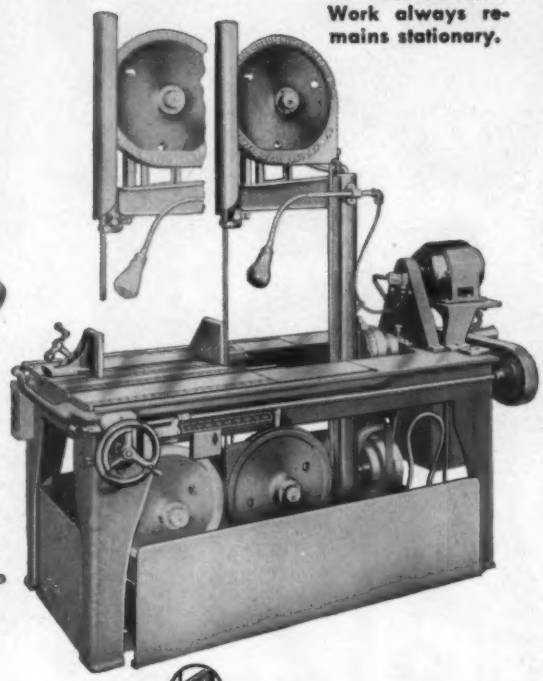
DANLY®

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue · Chicago 50, Illinois

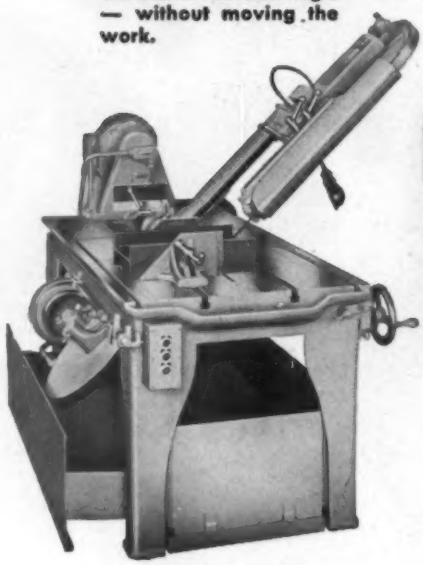
# Never Confuse the No. 8 MARVEL with an ordinary Band Saw

## ...only the MARVEL is Universal

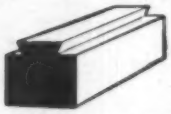
Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.



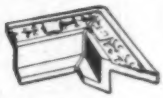
Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.



Only a No. 8 MARVEL can do all of these things: Snip-off a ⅛" rod or cut-off an 18" x 18" cross section



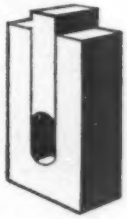
Rough to Size and Shape



Miter

Index

cut off and shape Structural Beams



Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

### "Rough Machine" to size and shape with minimun chip waste

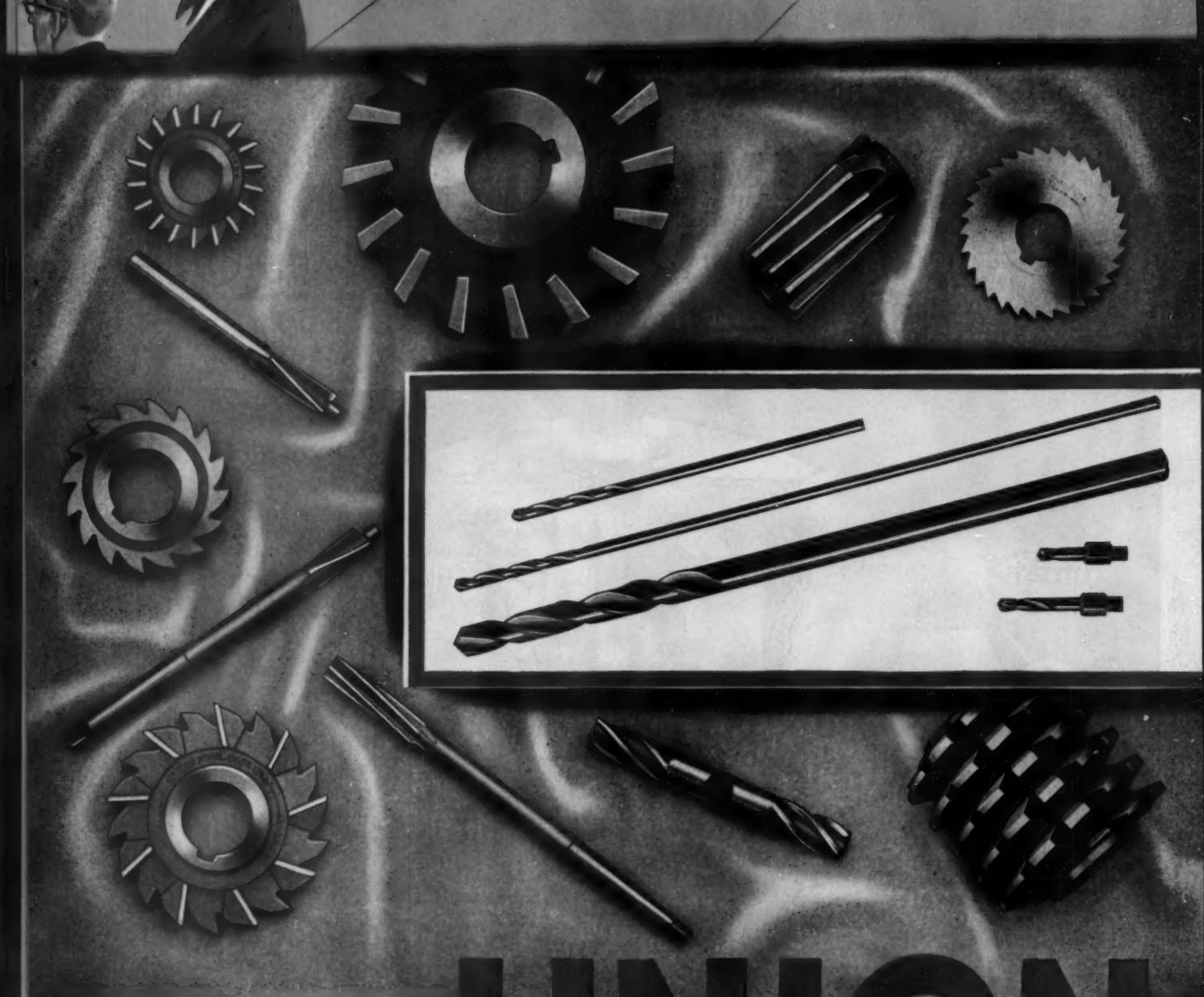
The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS

Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.



IN THE
AIRCRAFT INDUSTRY, IT'S

# UNION

## UNION DISTRIBUTORS SERVE THE NATION

FOR
- SPEED
- ECONOMY
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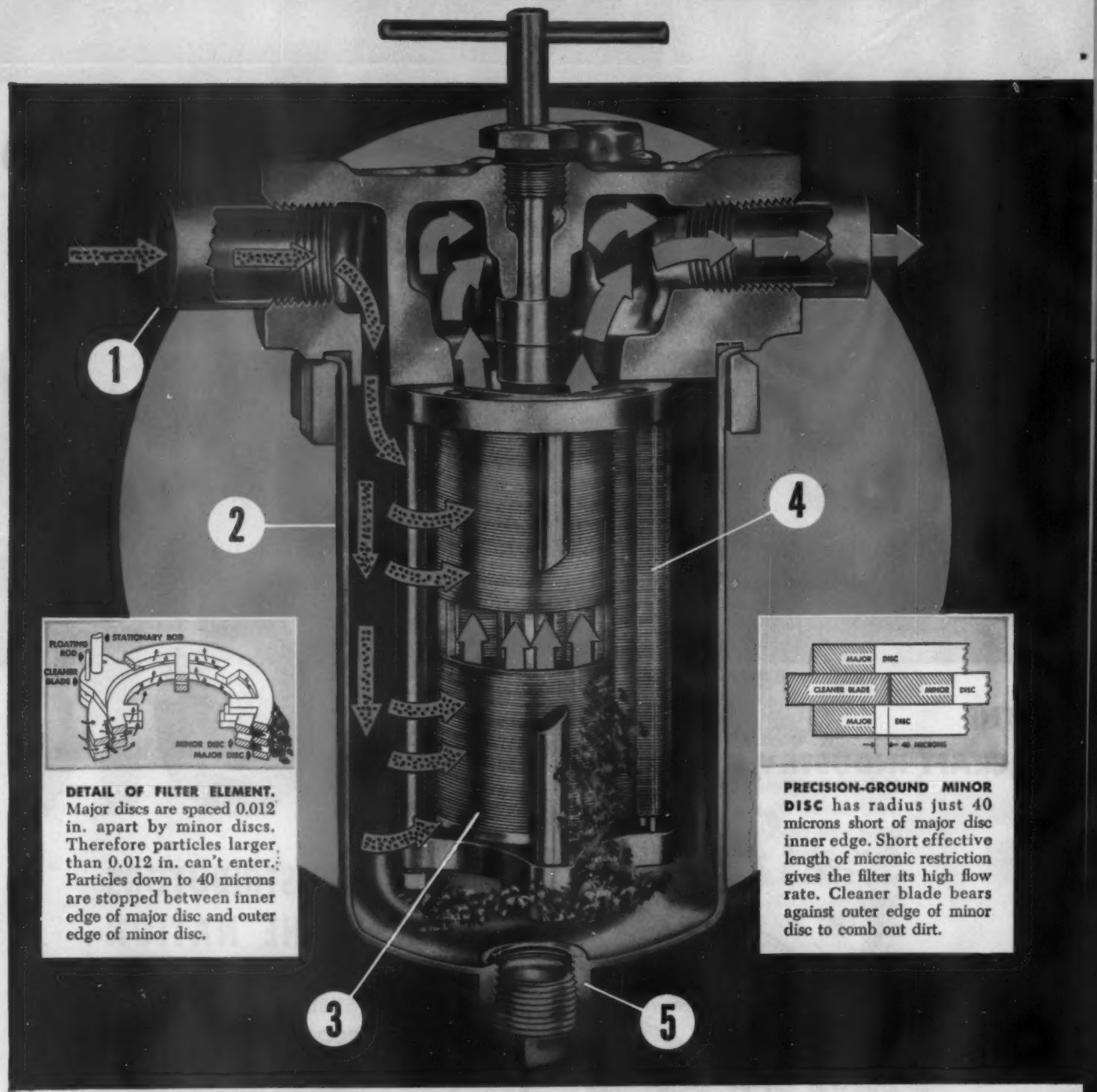
CALL YOUR UNION DISTRIBUTOR

**UNION TWIST DRILL COMPANY** • ATHOL, MASSACHUSETTS

*OWNERS AND OPERATORS OF:* S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

# New! CUNO 40-micron







**DETAIL OF FILTER ELEMENT.** Major discs are spaced 0.012 in. apart by minor discs. Therefore particles larger than 0.012 in. can't enter. Particles down to 40 microns are stopped between inner edge of major disc and outer edge of minor disc.




**PRECISION-GROUND MINOR DISC** has radius just 40 microns short of major disc inner edge. Short effective length of micronic restriction gives the filter its high flow rate. Cleaner blade bears against outer edge of minor disc to comb out dirt.

**CUTAWAY** of new SUPER Auto-Klean. Dirty liquid enters inlet (1) at left, fills housing (2) and flows through metal-edge filter (3) of stacked major and minor discs. Trapped dirt is combed out by cleaner blades (4) when discs are rotated and is removed through drain (5). Clean liquid rises through center of filter element, leaves at right.

# self-cleaning filter!

## The SUPER Auto-Klean for lube, hydraulic fluid, coolant, fuel and other liquids

. . . and you can clean this filter by simply turning the handle!

**Many times smaller than other micronic filters of equal capacity,** Cuno's new SUPER Auto-Klean filter now makes possible economical, compact, micronic filtration at high flow rates and eliminates the need for replacement cartridges. On machine tools and industrial machinery, SUPER Auto-Klean gives micronic filtration of lubricating oil, hydraulic fluids, coolants, fuels and other liquids. Here's what it offers:

1. Full-flow micronic filtering with a self-cleaning filter. Filter can be cleaned continuously with motor drive or intermittently by manually turning handle.

2. Eliminates cartridge changes. Ends operating costs if you've been using cartridge filters.

3. No pressure drop build-up. An 8-in. long, 2½-in. diameter cartridge handles 30 gpm of oil of 200 SSU viscosity with only 3 psi pressure drop—up to 75% more with slightly higher pressure drop.

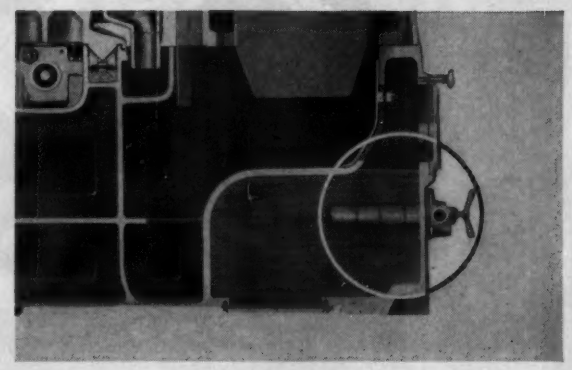
4. Positive protection against particles larger than 40 microns (actually 0.0015 in.). Filter can't rupture or channel.

5. Much smaller than replaceable-cartridge-type filters of equal capacity. It saves with lower initial costs, lower installation costs, requires less space than cartridge units. You get high capacity in a small package.

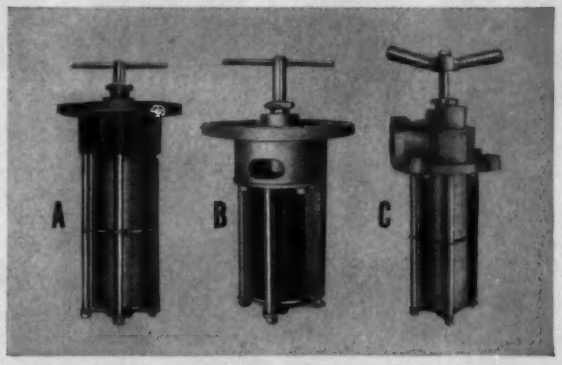
6. No duplex units needed. Handles full flow all the time with no interruptions for cleaning.

7. SUPER Auto-Klean fits existing Auto-Klean housings. You can easily replace most 2¾-in. diameter cartridges with SUPER Auto-Klean for finer filtration.

**Send coupon** for complete information on the new SUPER Auto-Klean filter, for your new designs or existing equipment. Cuno Engineering Corporation, 20-11 South Vine Street, Meriden, Conn. 5.6



**WILL IT FIT?** Here's how one designer answered that question. Filter *(circled)* mounts horizontally in side wall of hydraulic fluid reservoir in this surface grinder.




**FILTERS FOR INTERNAL PIPING** *(A and B above)* allow streamlined design plus the best in filtration. Flange mounting with external outlet *(C above)* and line-type *(cutaway on facing page)* are just two of many other possibilities.

*MAIL COUPON FOR COMPLETE INFORMATION*

CUNO

*ENGINEERED FILTRATION*

**Removes More Sizes of Solids from More Kinds of Fluids**

**AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge)**
**FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)**

**CUNO ENGINEERING CORPORATION**
**1-12 South Vine St.**
**Meriden, Conn.**

**Please send me full data on the NEW Cuno SUPER Auto-Klean filter.**

Name_____

Firm_____

Position_____

Address_____

City_____ Zone_____ State_____

# right in tune

## ...and REX is the standard by which all other high speed steels are compared

A tuning fork sounds the *standard pitch* to which musical instruments are compared. There's a recognized standard for high speed steels, too — Crucible REX®.

But don't take our word for it. Try REX in your own shop. Compare its structure, finish, hardenability, carbide distribution and general uniformity. Measure the *extra performance* you get. You'll see for yourself why no other tool steel outperforms REX . . . why it's the *standard for comparison* wherever high speed steels are used.

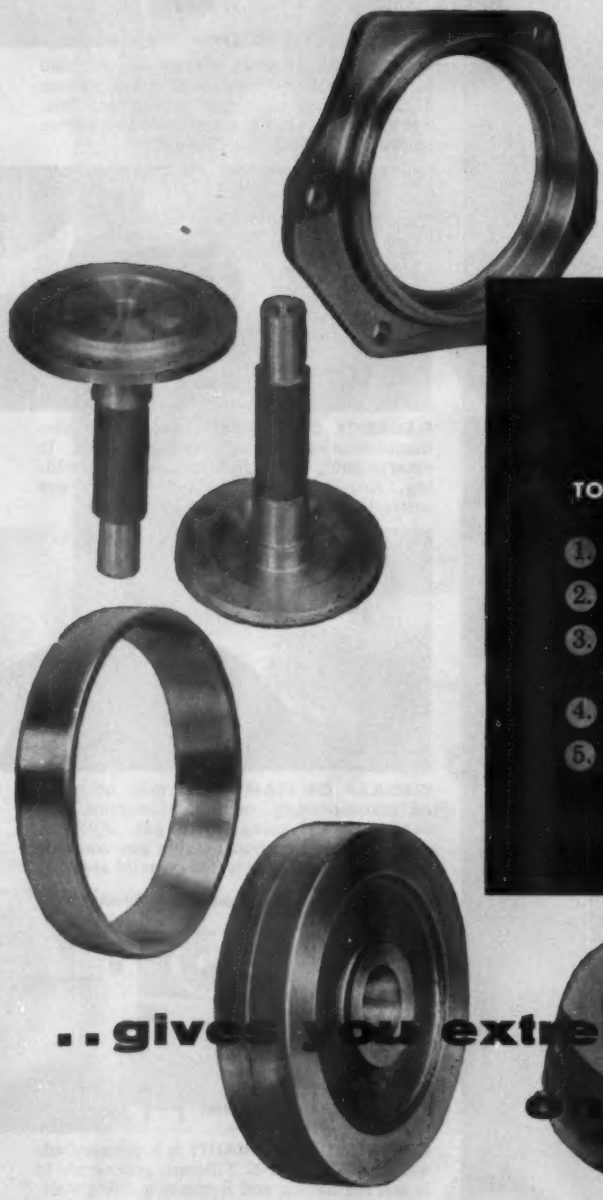
Next time you buy tool steels, be sure of top performance — specify REX. Remember, it's made only by Crucible — and is available from local warehouse stocks, or by prompt mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

# Acme-Gridley

# CHUCK-MATIC



## *Designed Specifically*

**TO REDUCE MACHINING COSTS ON PARTS LIKE THESE**

1. Cycle time is automatically controlled.
2. The chuck-matic is easy to set up and retool.
3. One man can operate as many machines as cycle times of jobs permit.
4. Saves floor space—only 45″ wide, 64″ long.
5. Positive precision—at speeds and feeds as fast as carbide tools will take it.

**Want more information? Ask a National Acme engineer to see you—write for CATALOG SC-46**

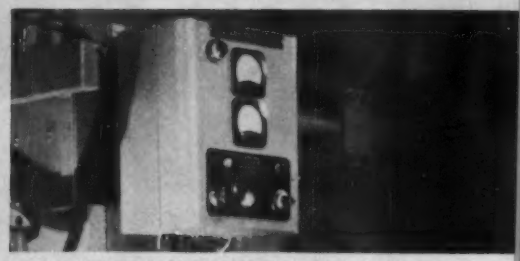
**..gives you extreme precision on the heaviest cuts..**

the National Acme company

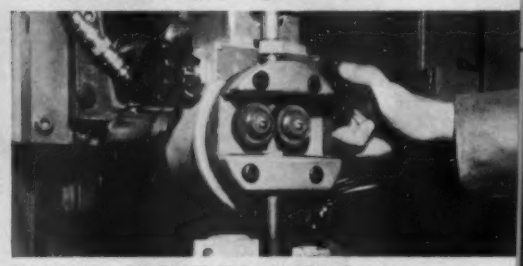
171 EAST 131ST STREET • CLEVELAND 8, OHIO

# NEW G-E Automatic Welding Equipment Matches Speed of Any Production Line

## FILLERARC METHOD FEEDS FILLER WIRE AT ANY SPEED UP TO 1000 INCHES PER MINUTE

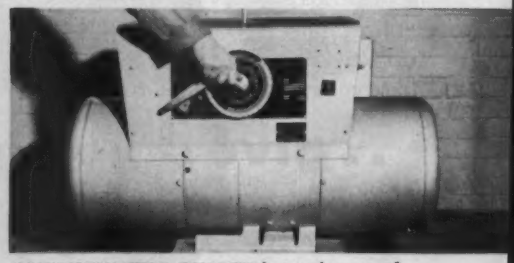


**WIDE RANGE OF WIRE SPEEDS**—up to 1000 inches per minute—makes this G-E system flexible enough for any production line. Speed is constant since system is insensitive to normal line-voltage changes.



**FLEXIBILITY OF FILLERARC SYSTEM** is also demonstrated by the automatic head. It rotates 360°, allowing even overhead welding. Arc is completely visible since gas instead of flux is used as the shield.

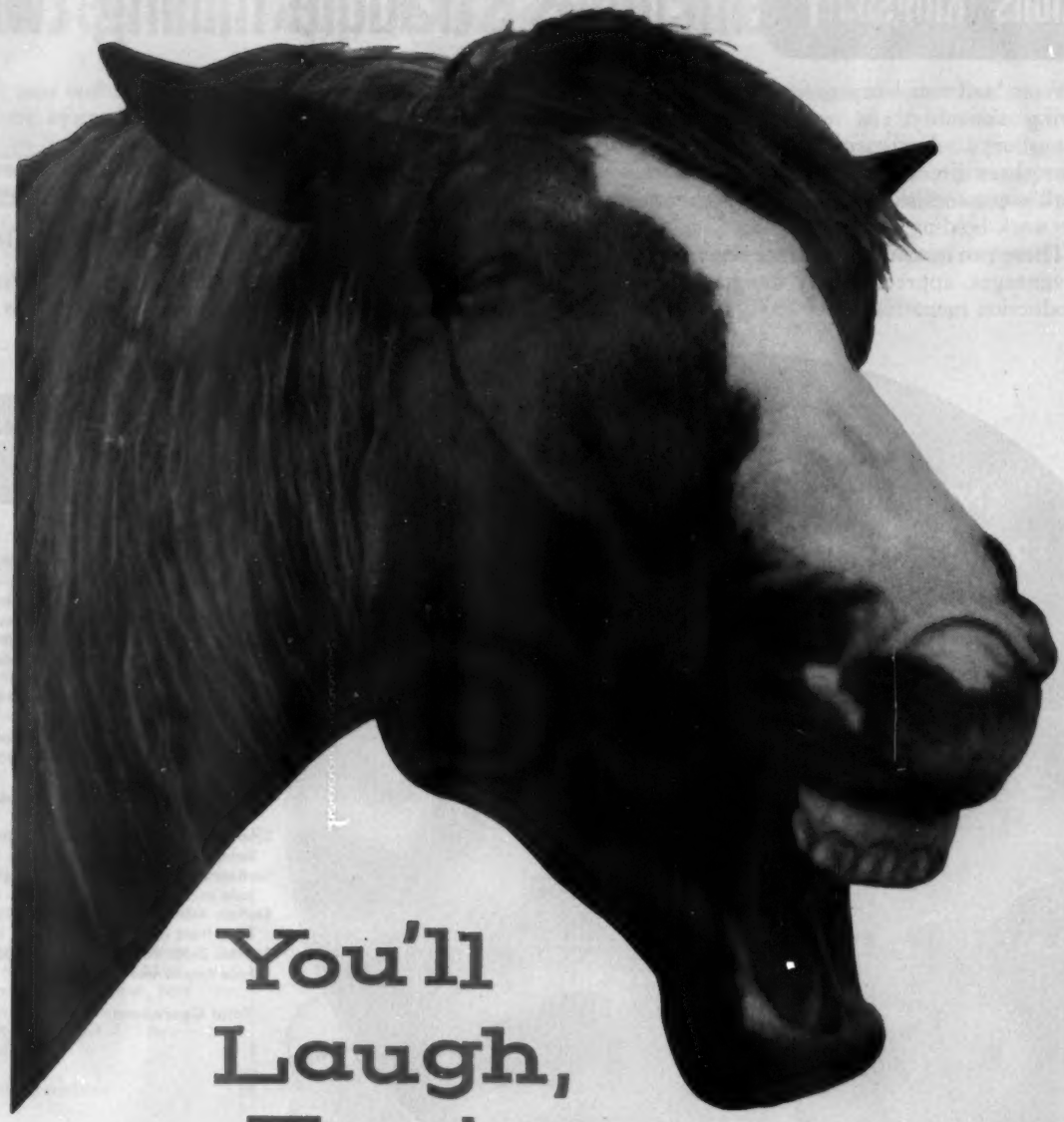
**CIRCULAR OR SEAM WELDS** may be made on stainless steel, copper, aluminum, and other metals—using inert gas. Fillerarc generator and carbon dioxide gas combine for low-cost, quality welds on mild steel.



**CONSISTENT WELD QUALITY** is a primary advantage of the G-E Fillerarc generator. It is self regulating and features a rising volt-amp curve which matches the arc curve—for reliable in-line operation.

*For details, write for bulletin GEC-1334, Section 713-2, General Electric Co., Schenectady, N. Y., or call your G-E Welding Distributor.*

GENERAL ELECTRIC



# You'll Laugh, Too!

**YOU'LL GIVE YOUR GRINDING PROBLEMS A LONG, DRAWN OUT HORSELAUGH WHEN YOU SWITCH TO CINCINNATI (PD) WHEELS.**

For *now* CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

And you'll keep right on smiling with pleasure every day that CINCINNATI (PD) WHEELS are on the job. Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

*Yet* CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.* So, doesn't it make good horse sense to get full details on CINCINNATI (PD) WHEELS right away?

Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . .

(PD) POSITIVE DUPLICATION

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

CINCINNATI *Grinding Wheels*

# "Operations Kingsbury" includes straddle milling two

Front and rear hangers for an automobile front spring assembly are machined on these two Kingsburys. Design of each part requires work from three directions: top, front *and back*. This work is accomplished in one cycle without rotating the work-holding fixtures.

These two machines illustrate several important advantages, appreciated by design engineers and production men.

For example: high production at low cost per part. The following table tells this story:

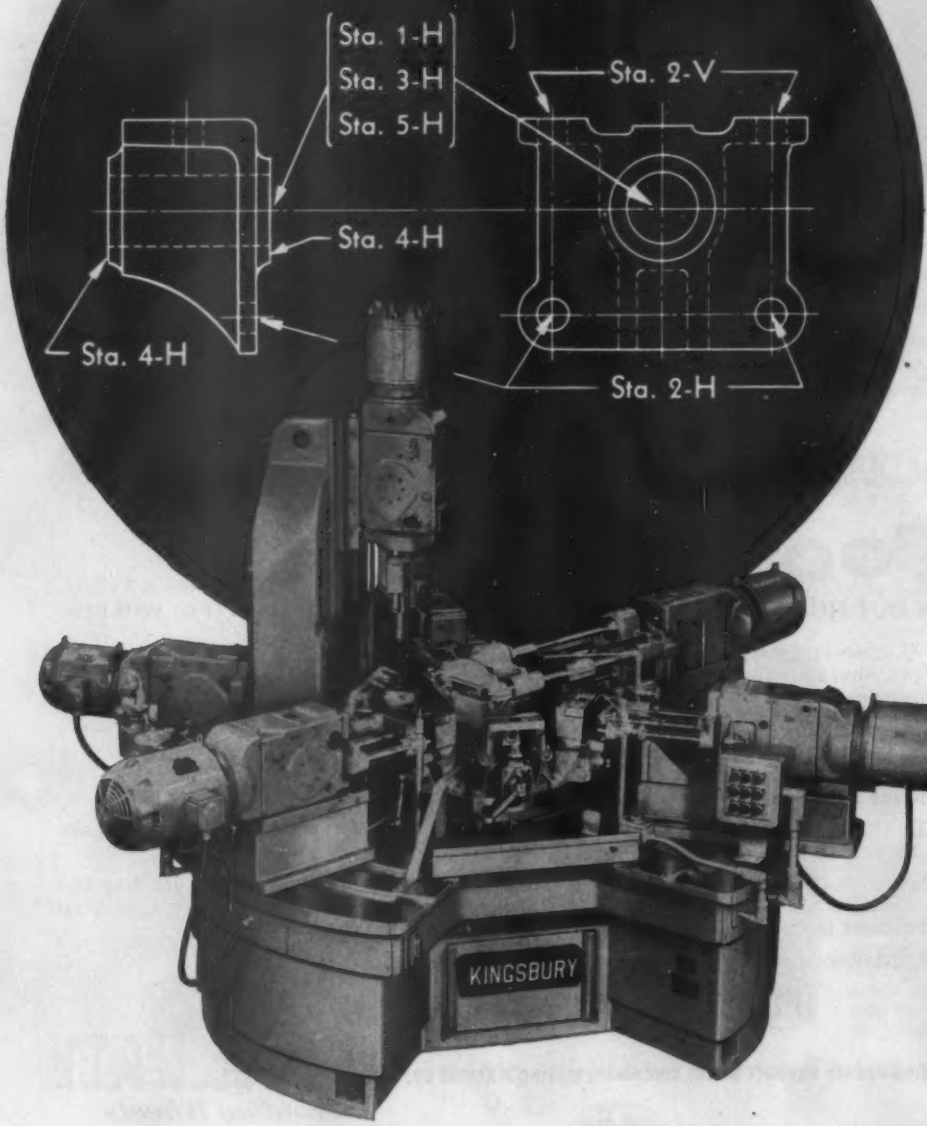
| Part | Number of Operations | Parts per hour, gross | Cost per part |
|---|---|---|---|
| REAR HANGER (at right) | 10 | 240 | 4-6/10c . |
| FRONT HANGER (at left) | 9 | 265 | 3-6/10c |

**REAR HANGER: Two milling operations for only 1c.**

## 9 Operations - 3 6/10 ¢ per part

(Malleable Iron)

FRONT SPRING FRONT HANGER




This Kingsbury machine has a 96-inch base and 26-inch index table. Six work units are mounted on the base. Six work-holding fixtures are mounted on the table, which indexes through six-stations (one for loading and unloading). All work is performed at five stations, without removing the part from the fixture.

| Work | Operations |
|---|---|
| Station 1-H: Core drill .853/.855 hole undersize | 1 |
| Station 2-H: Drill .375 thru — two holes | 2 |
| Station 2-V: Drill .375 thru — two holes | 2 |
| Station 3-H: Rough ream .853/.855 hole undersize | 1 |
| Station 4-H: Spotface bosses 1.25 dia., front and rear | 2 |
| Station 5-H: Finish ream .853/.855 hole thru to size | 1 |
| Total Operations | 9 |

KINGSBURY

# bosses for approximately one cent

There's nothing particularly difficult about any of these operations — until we consider the production output and low cost per part. Even at 80% efficiency, delivery of a finished part such as these *every* 19 *seconds* or less, is profitable business for the manufacturer.

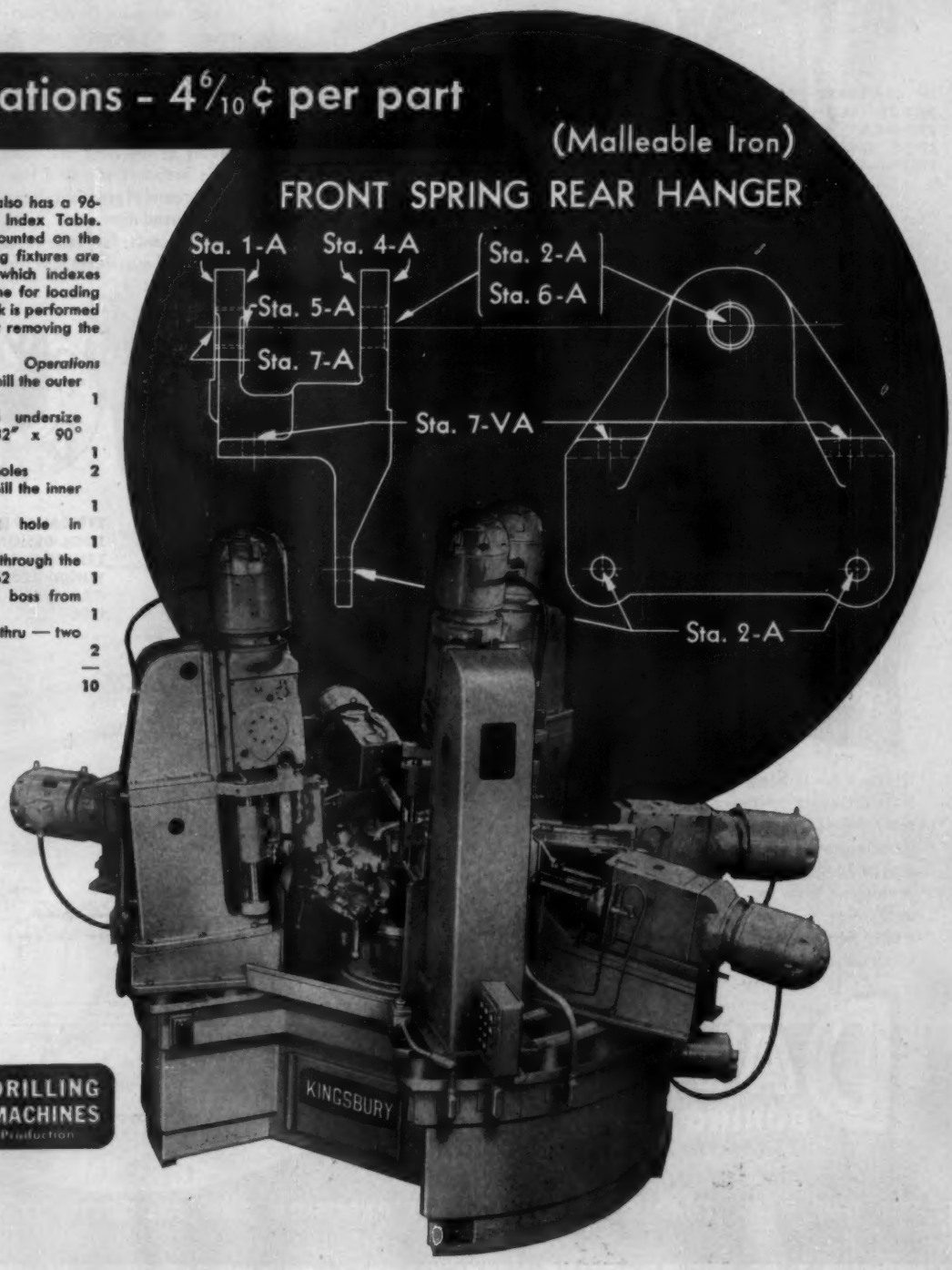
Today, the design engineer has greater freedom than ever before. He can now design parts with less worry about *manufacturing* operations . . . because, here at Kingsbury we know what operations a Kingsbury *can* do. So, if we feel that a Kingsbury machine will justify itself in your production schedule, you can plan on high production, low cost per part, and uniform quality.

Kingsbury Machine Tool Corporation
111 Laurel Street
Keene, New Hampshire

## 10 Operations - $4\frac{6}{10}$¢ per part

(Malleable Iron)

FRONT SPRING REAR HANGER



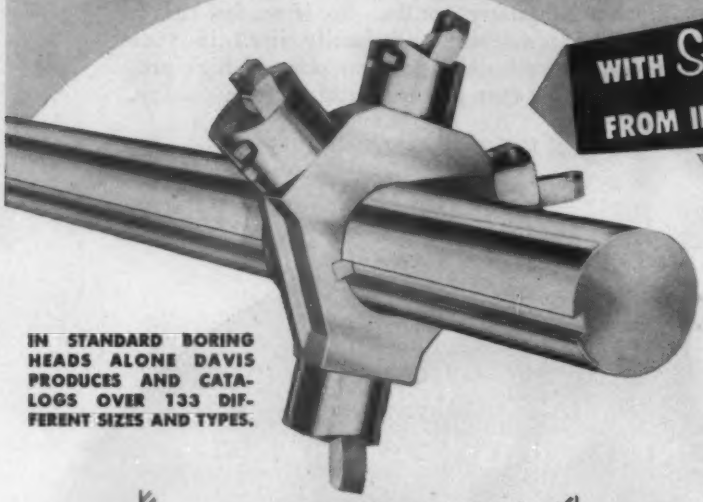

The Kingsbury machine also has a 96-inch base, with 30-inch Index Table. Seven work units are mounted on the base. Eight work-holding fixtures are mounted on the table, which indexes through eight stations (one for loading and unloading). All work is performed at seven stations, without removing the part from the fixture.

| Work | Operations |
|---|---|
| **Station 1-A:** Straddle-mill the outer boss | 1 |
| **Station 2-A:** Drill .656 undersize and countersink 23/32" x 90° one hole in outer boss | 1 |
| Drill .375 thru — two holes | 2 |
| **Station 4-A:** Straddle-mill the inner boss | 1 |
| **Station 5-A:** Drill .562 hole in inner boss | 1 |
| **Station 6-A:** Line ream through the two holes, .656 and .562 | 1 |
| **Station 7-A:** Tap inner boss from rear: ⅝ — 16 Tap | 1 |
| **Station 7-VA:** Drill .375 thru — two holes | 2 |
| **Total Operations** | 10 |

**AUTOMATIC DRILLING AND TAPPING MACHINES**
for Low Cost High Production

# Let DAVIS cut your Boring Costs 2 ways

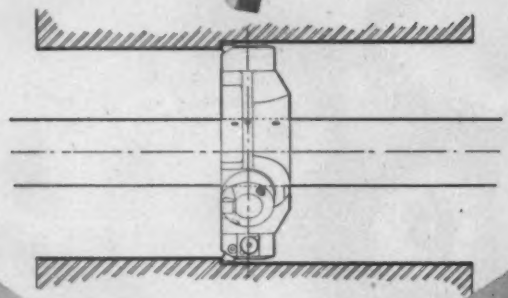
## WITH Standard Tooling ITEMS FROM INDUSTRY'S MOST COMPLETE LINE



IN STANDARD BORING HEADS ALONE DAVIS PRODUCES AND CATALOGS OVER 133 DIFFERENT SIZES AND TYPES.

Every boring job in your shop... regardless of range, material or complexity... can be done faster, cheaper and with greater precision, when you make Davis your tooling headquarters. That's because only Davis has both the complete line and broad machining experience to supply or design exactly the right tool for your work.

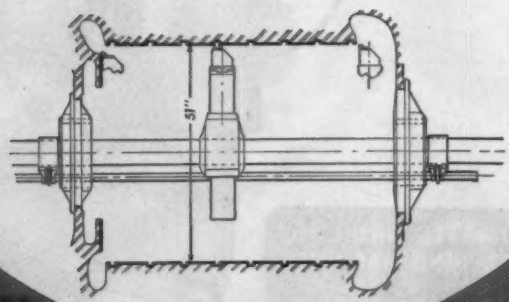
Davis tooling specialists help you immeasurably in selecting the right tool from industry's broadest standard line. Their unrivalled background of practical shop experience assures recommendations that exactly meet all your requirements for tolerances, finish, speeds, feeds and maximum tool life at minimum cost.



TYPICAL OF DAVIS SPECIAL TOOL DESIGNS IS THIS EXTENSION BORING HEAD WHICH BORES, FACES AND GROOVES A 51" DIAMETER HOLE.

## WITH Job-Engineered SPECIALS FROM INDUSTRY'S FOREMOST DESIGNERS

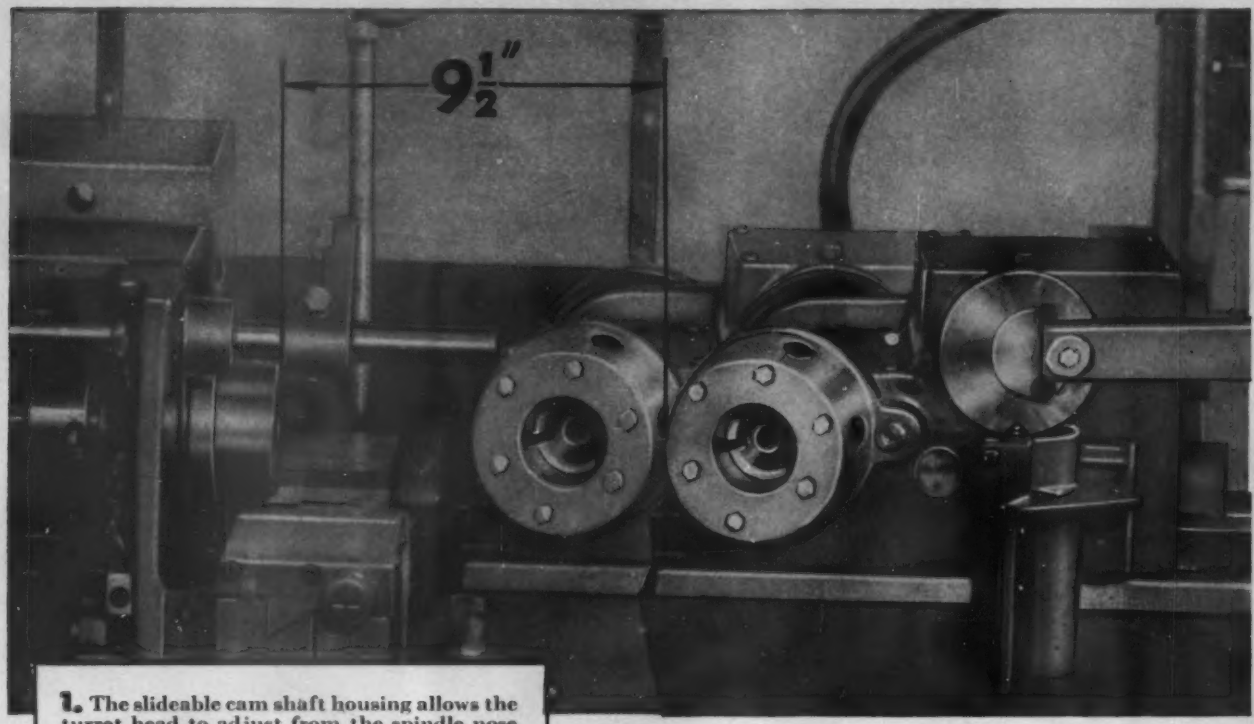
Where work is beyond the scope of standard tools or where efficiency can be improved or costs reduced by combined operations, special fixturing, etc., the specialists in Davis Engineered Tooling Service will work with you in developing tools for even the most complex application. Consult your local Davis field engineer or send us complete work details for impartial recommendations.



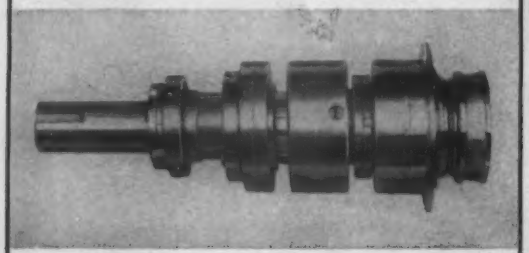

DAVIS
BORING TOOL DIVISION
of Giddings & Lewis Machine Tool Company
Fond du Lac, Wisconsin

THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING

CINCINNATI MILLING PRODUCTS DIVISION • THE CINCINNATI MILLING MACHINE CO. • CINCINNATI 9, OHIO




**1.** The slideable cam shaft housing allows the turret head to adjust from the spindle nose —2¼" to 9½". This offers you an extra long working capacity. Turret tools can work on end of stock feed-out up to 7".



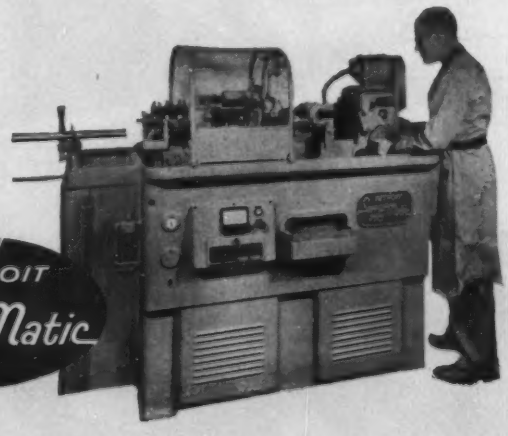
**2.** The extra-rugged spindle, with preloaded angular contact double ball bearings at the nose, is designed to withstand high tool pressure. High production speeds and heavy tool loads are easily maintained. If you need additional diameter capacity—the machine will handle bar stock up to 1" with outside feed.

**3.** The machine is equipped with an "Adjusto-Spede" drive control by three potentiometer dials—just set and read. Each dial may be set from 100 to 5100 r.p.m. (higher speeds available on request). Each of the preselected infinitely variable speeds may be tripped in any time during the cycle. All speeds are reversible. An additional feature allows reversing up to 2500 r.p.m.

# 3 "extra capacity" reasons why the Detroit Screwmatic 750 is revolutionizing the screw machine industry

Among the many unique developments you'll find in the Detroit Screwmatic 750 are the 3 extra capacity features illustrated here. They offer you versatility in your screw machine production never before possible with a single spindle automatic. Why not investigate the many other advantages of the Detroit Screwmatic 750.

Write, wire or phone today for complete comprehensive information.




*A product of*

**THE GEAR GRINDING MACHINE CO.**

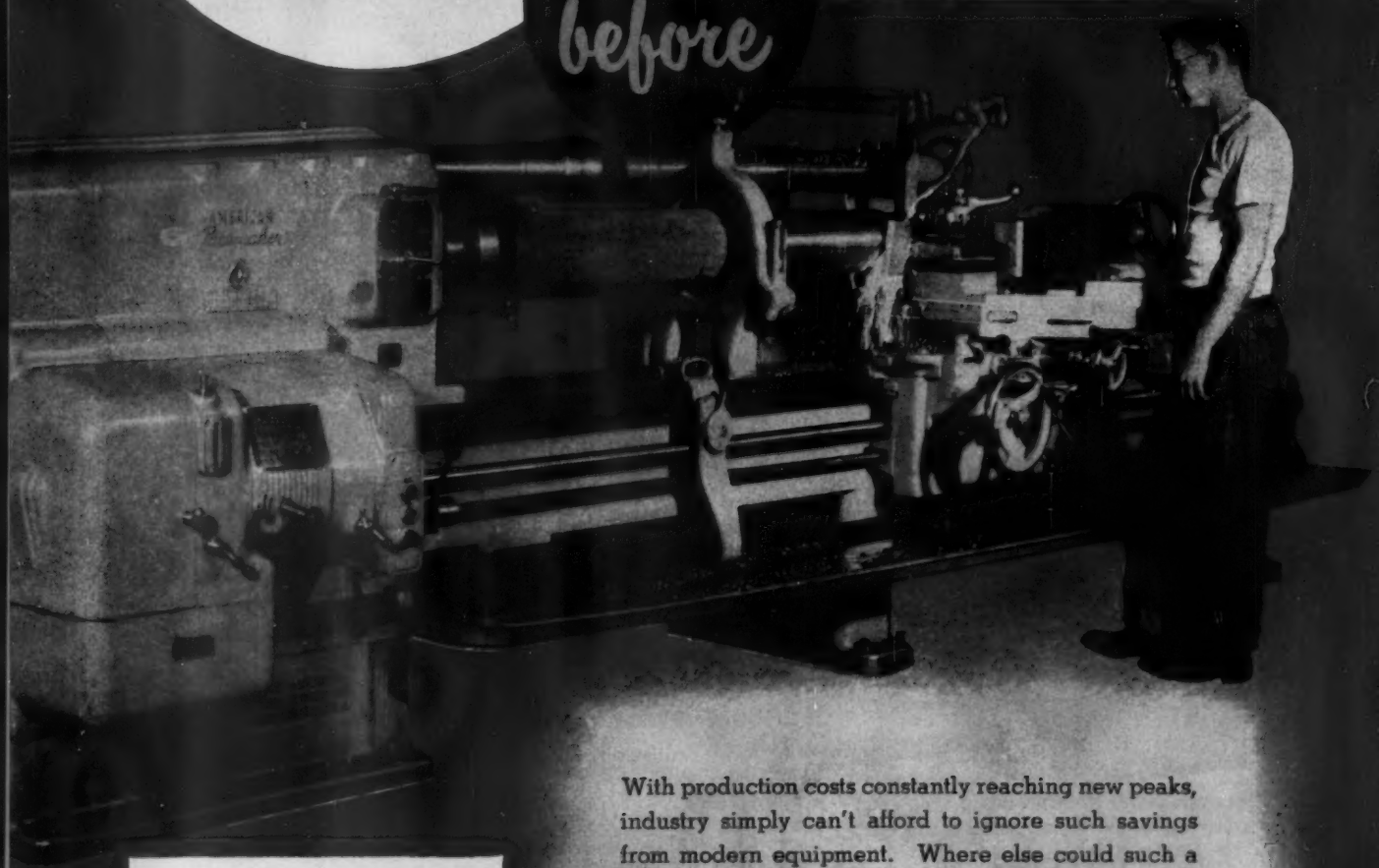
3919 Christopher • Detroit 11, Michigan

*MANUFACTURERS OF:* Fully Automatic Gear Grinding Machines • Rzeppa (pronounced "Sheppa") Constant Velocity Universal Joints.

# 2¼ hrs. now

9 hrs. before

**Fairbanks, Morse & Co., Beloit, Wisconsin, is *really* putting the payroll dollar to work with its new 20 inch "AMERICAN" Heavy Duty All-Hydraulic Duplicating Lathe.**



**2000 horse power Fairbanks-Morse motor shafts are now being rough and finished turned in 2¼ hours floor to floor against a former time of 9 hours per shaft.**

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

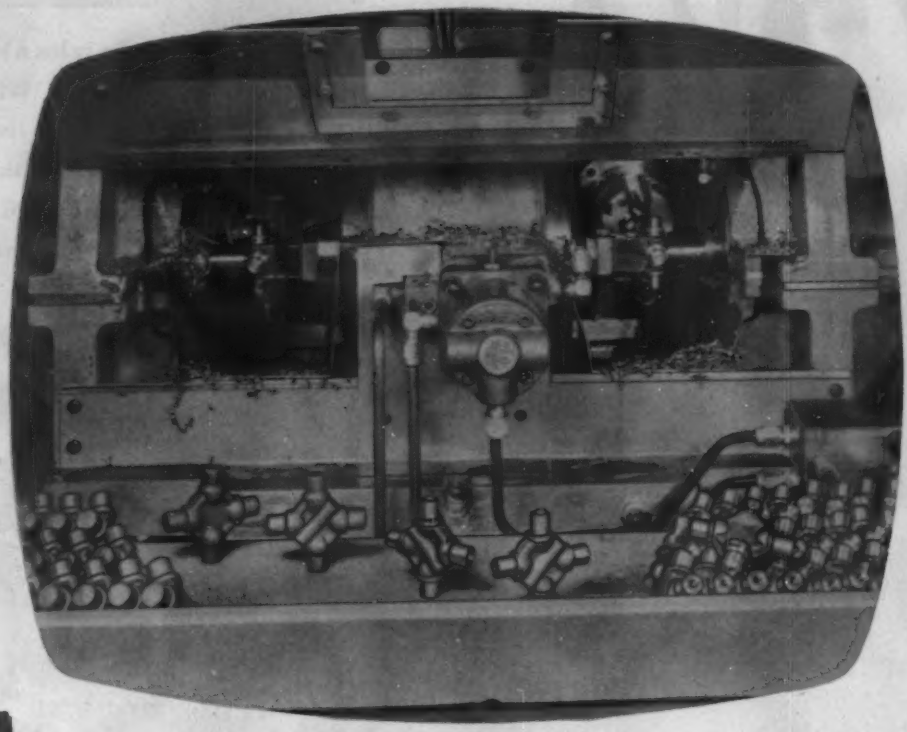
Put your payroll dollar to work for greater profits with "AMERICAN".

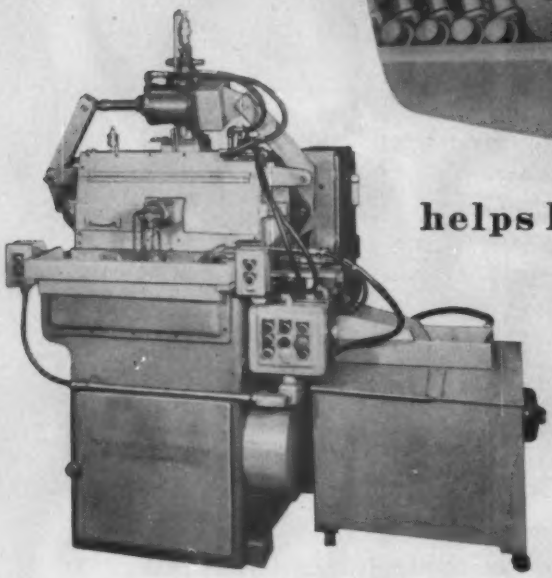
*Bulletin No. 35 shows many examples—it's yours for the asking.*

**THE AMERICAN TOOL WORKS CO.** Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

# BRYANT PRECISION BORING MACHINE

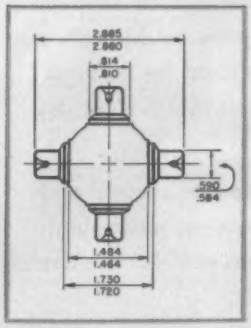




## helps leading automotive parts maker meet tight production schedules

This manufacturer attains peak production per spindle investment by machining universal joint spiders on the Bryant 998 Precision Boring Machine. All four ends of each spider are turned, form turned, faced, chamfered and centered—*complete in 25 seconds!* In one pass, .088 stock is removed from diameters, .044 from the faces. *Production—144 complete parts per hour at 100%.*

In addition, flexible tooling design permits quick, simple change-over to a variety of spiders.




The Bryant 998 is mechanically operated by positive cam action. Its table moves on heavily pre-loaded, anti-friction ball slide ways. Six hundred $\frac{3}{8}$"-diameter pre-loaded balls carry the table. All running parts are made of hardened and ground steel, permanently lubricated and completely enclosed. The large diameter bars and 6" table motion provide accurate, rigid slide mounting which holds the table to a true path regardless of load or loading direction.

You, too, can get uniform fine finishes, high repetitive accuracy and peak production per spindle investment—in precision boring, drilling, turning, facing, grooving, and contour boring and turning. *Write for Bryant 998 Job Folder.*

*Bryant offers you three methods of acquisition: 1.) outright purchase, 2.) conditional sale (short-term or long-term), 3.) lease.*

BRYANT

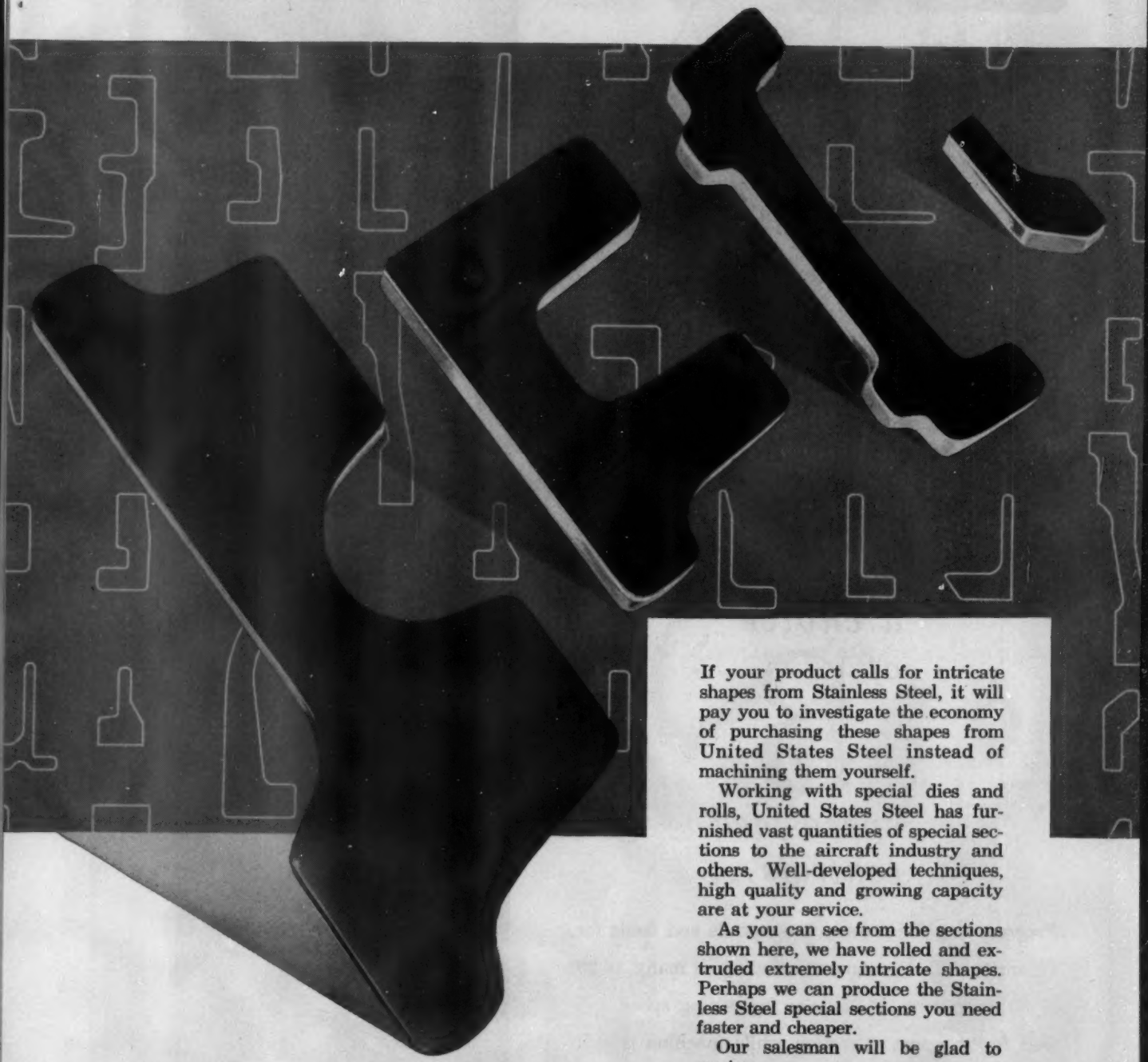
# chucking grinder co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

*Internal Grinders • Boring Machines • Internal & External Thread Gages • Groove Gages • Granite Surface Plates • Spindles • Magnetic drums for computers*

# You can save machining costs with special sections–rolled or extruded of **USS STAINLESS STEEL**



If your product calls for intricate shapes from Stainless Steel, it will pay you to investigate the economy of purchasing these shapes from United States Steel instead of machining them yourself.

Working with special dies and rolls, United States Steel has furnished vast quantities of special sections to the aircraft industry and others. Well-developed techniques, high quality and growing capacity are at your service.

As you can see from the sections shown here, we have rolled and extruded extremely intricate shapes. Perhaps we can produce the Stainless Steel special sections you need faster and cheaper.

Our salesman will be glad to quote.

## USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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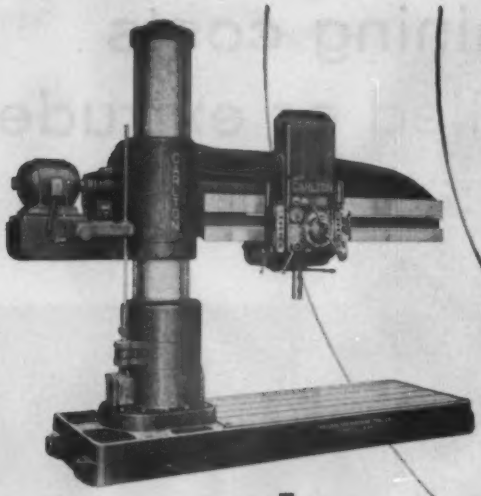
UNITED STATES STEEL



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*give you a choice of* 3 *speed-feed controls...*

programming

pre-selector

manual

*Programming* for pre-selecting speeds and feeds for an entire drilling program including as many as 20 or 30 operations. *Pre-selector* for setting speed and feed for the next operation while machine is still under cut. *Manual* to take advantage of Carlton's centralized push button control. For further information, send today for free descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

# SNYDER SEGMENTED AUTOMATION in 91 station, 182 operation, in-line transfer machine features four segments which can operate independently or as a unit to assure continuous production of automotive automatic transmission cases at 100 cases an hour at 80% efficiency

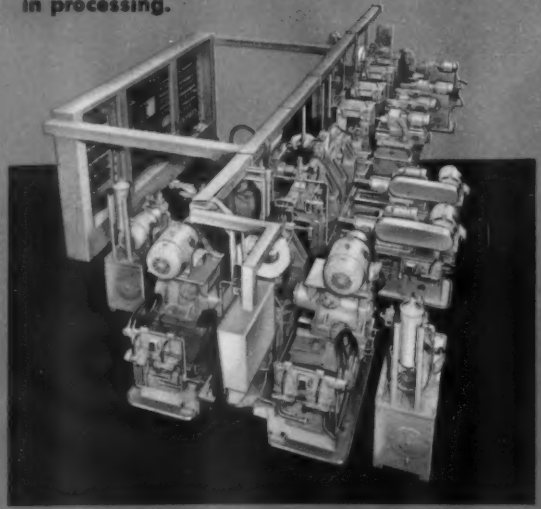
# SNYDER

## TOOL & ENGINEERING COMPANY

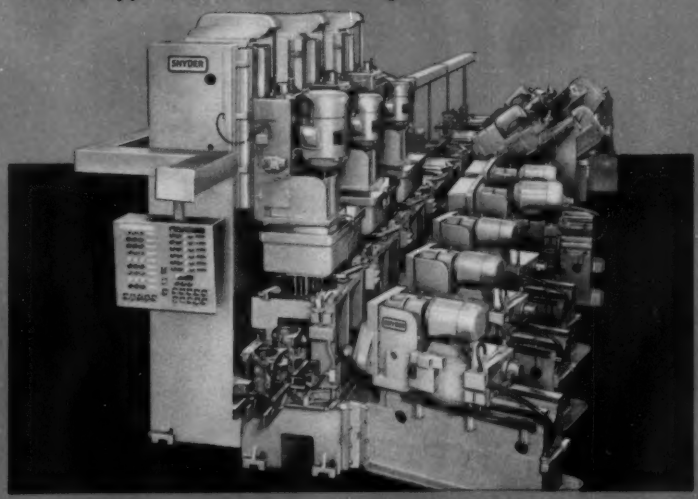
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

*30 Years of Successful Cooperation with Leading American Industries*

SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.

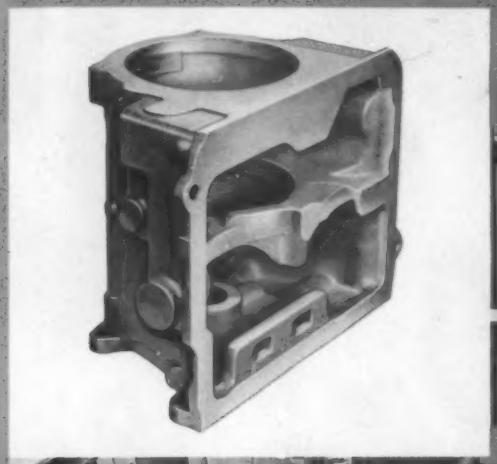


SEGMENT 2: 47 feet long, 31 stations, 91 spindles. In top face, end and at angular locations inside, 51 holes are drilled, countersunk, semi-finish and finish reamed, spotfaced, tapped. Part is tilted 90 degrees and rotated.



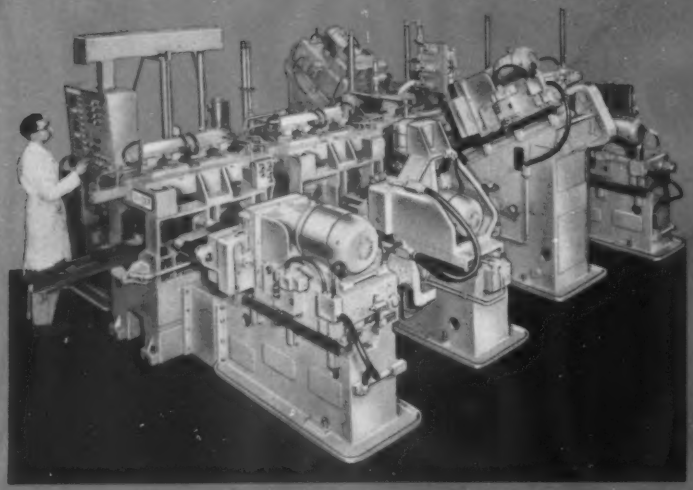
**SNYDER TOOL and ENGINEERING COMPANY**

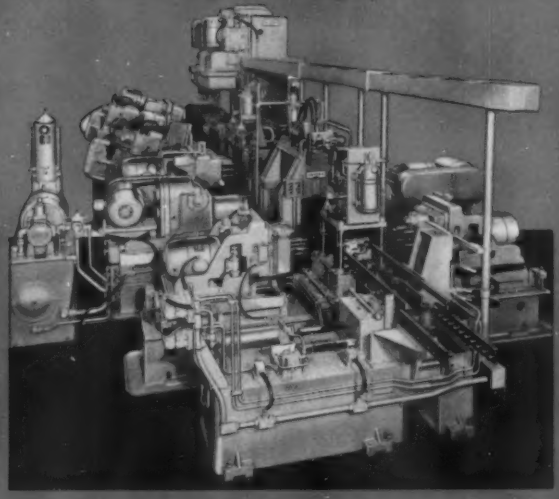
**As a fitting climax to our thirtieth anniversary year, we are happy to announce plant expansions which will add about one third to our machine shop and assembly floor areas and which will enable us to add to our precision machining equipment and accommodate more manpower. We are happy, too, to take this opportunity to thank all our friends who have made this modern plant possible—our customers, our suppliers and all of the hundreds of members of the Snyder family of workers, here and throughout the country.**

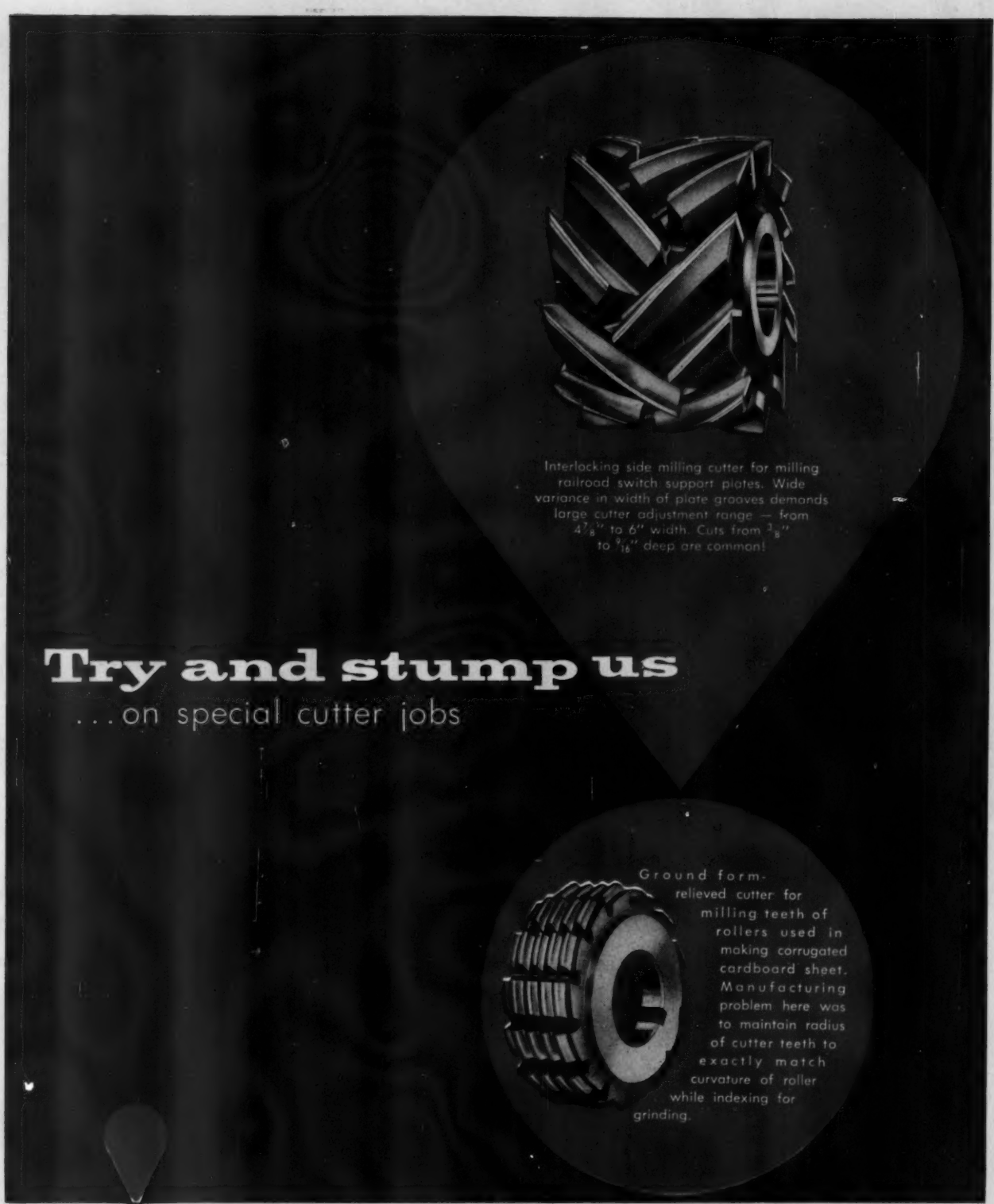


SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.

SEGMENT 4: 36 feet long, 24 stations, 60 spindles. Various drilling, chamfering, tapping, semi-finish boring and facing operations.






Interlocking side milling cutter for milling railroad switch support plates. Wide variance in width of plate grooves demands large cutter adjustment range — from 4 7/8" to 6" width. Cuts from 3/8" to 9/16" deep are common!
Try and stump us
. . . on special cutter jobs
Ground form-relieved cutter for milling teeth of rollers used in making corrugated cardboard sheet. Manufacturing problem here was to maintain radius of cutter teeth to exactly match curvature of roller while indexing for grinding.

**We mean it** Every day our engineers are designing and building special cutters for milling virtually everything from hosiery needles to railroad switch support plates. And every job saves the customer money! How? First; all Brown & Sharpe special cutters get the benefit of unmatched experience in milling problems. They're designed by *specialists*. Second; extensive facilities for manufacture and heat treatment complete the job perfectly . . . turn out cutters that pay off in precision, productivity, and stamina. Look at the typical cases illustrated. Then, for a *profitable* solution to *your* special cutter problems — try and stump us! Brown & Sharpe Mfg. Co., Providence 1, R. I.

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# A PRACTICAL REPLACEMENT PROGRAM?

## *YES!* — and Jones & Lamson can help you develop it

Industry unanimously endorses the idea of planned replacement of capital equipment. Nevertheless, most of America's machine tools are more than 10 years old, sadly inferior to today's profit-producing equipment. The idea is sound — but action is lacking.

*Biggest reason for this paradox is financial.* Until recently, replacement required a substantial outlay of capital. In many cases, needed capital was lacking; in others, the capital, though available, had many other calls upon it. Unrealistically low depreciation allowances on capital equipment served as an added deterrent to replacement.

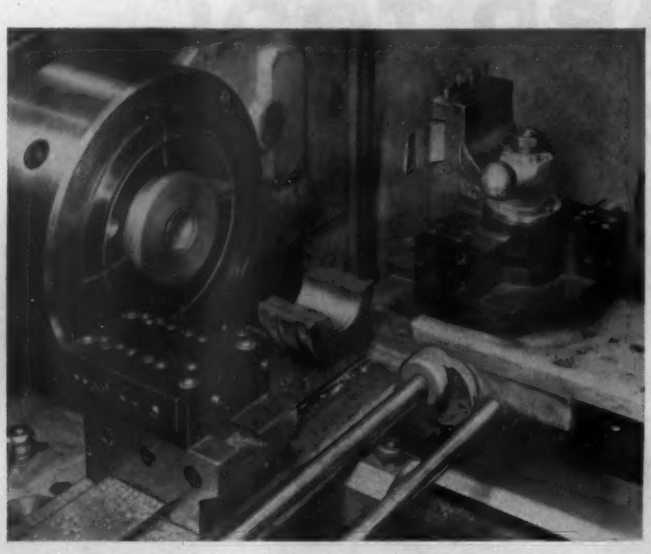
*The picture has changed.* Now, provisions of our new tax laws permit more equitable write-offs, and make replacement a more attractive proposition.

Jones & Lamson makes replacement even *more* feasible, by clearing away the traditional difficulties of financing with its unique Procurement Plans.

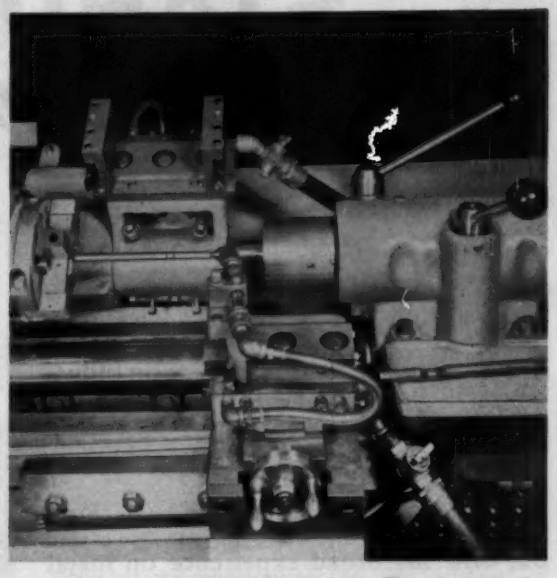
This, then, is what Jones & Lamson offers: modern machine tools that can greatly improve your production; *plus* your choice of several sound, low-cost (interest rates of 3¼%, and lower, add-on) methods of procuring these tools.

◀ **OBSOLETE** machine tools like these hamper industrial growth, keep production low, and costs high.

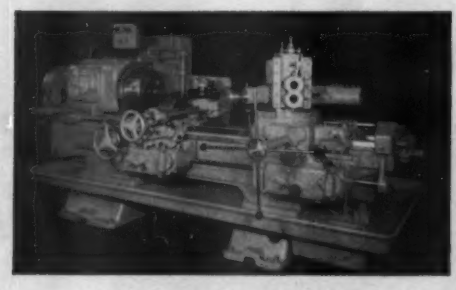
**RESEARCH** in machining methods, metallurgy, tool geometry, is carried on continually by J & L. Important findings have resulted in the incorporation of unique engineering features in J & L machines.



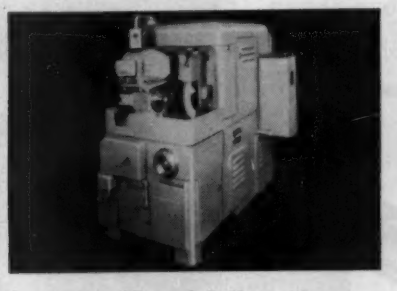
**IMPROVED** production on this difficult machining job was made possible by J & L engineers' close co-operation with the customer. Research testing, and incorporation of special features on a J & L turret lathe cut time-per-piece on this bottle neck-ring from 14 to 5½ min., increased production 120%!



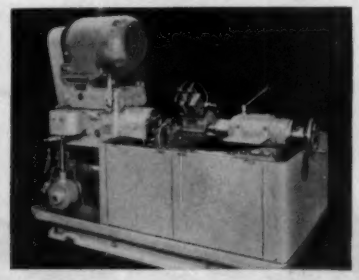
**AUTOMATIC OPERATION.** One Fay Automatic Lathe replaced eight engine lathes formerly used on this job — and substantially increased production of sewing machine crankshafts at the same time.



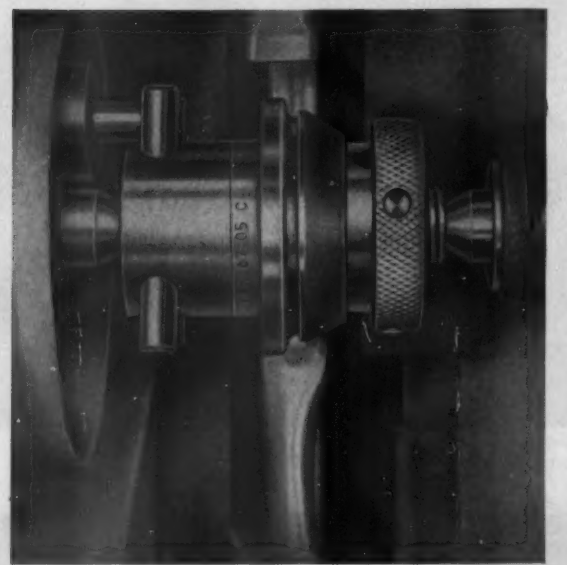
Universal Turret Lathes



Automatic Thread & Form Grinders



Fay Automatic Lathes



**GRINDING.** This J & L Model "E" Form Grinder, used in producing seaming rolls for the canning industry, completely eliminated a roughing operation, increased production by 100%.

# JONES & LAMSON

## MACHINE J&L COMPANY

502 Clinton St., Springfield, Vt., U. S. A.

Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread & Form Grinders
Optical Comparators • Automatic Opening Threading Dies & Chasers
Automatic Double-End Milling & Centering Machines

*Send today for complete details on J & L's machines, methods and Procurement Plans. Simply fill in the coupon below,* clip it to your letterhead *and mail. We'll do the rest.*

**JONES & LAMSON MACHINE COMPANY**
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GENTLEMEN:

Please send me the J & L Machine Tool Replacement Information Kit.

*Name*.....

*Title*.....

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● The Standard Tool Man, Serving Industry Since 1881, can recommend the correct tap, grind and speed that will enable you to reduce your production costs. Find out how his broad experience on metal cutting can help you. The Standard Tool Man is always at your service without obligation.

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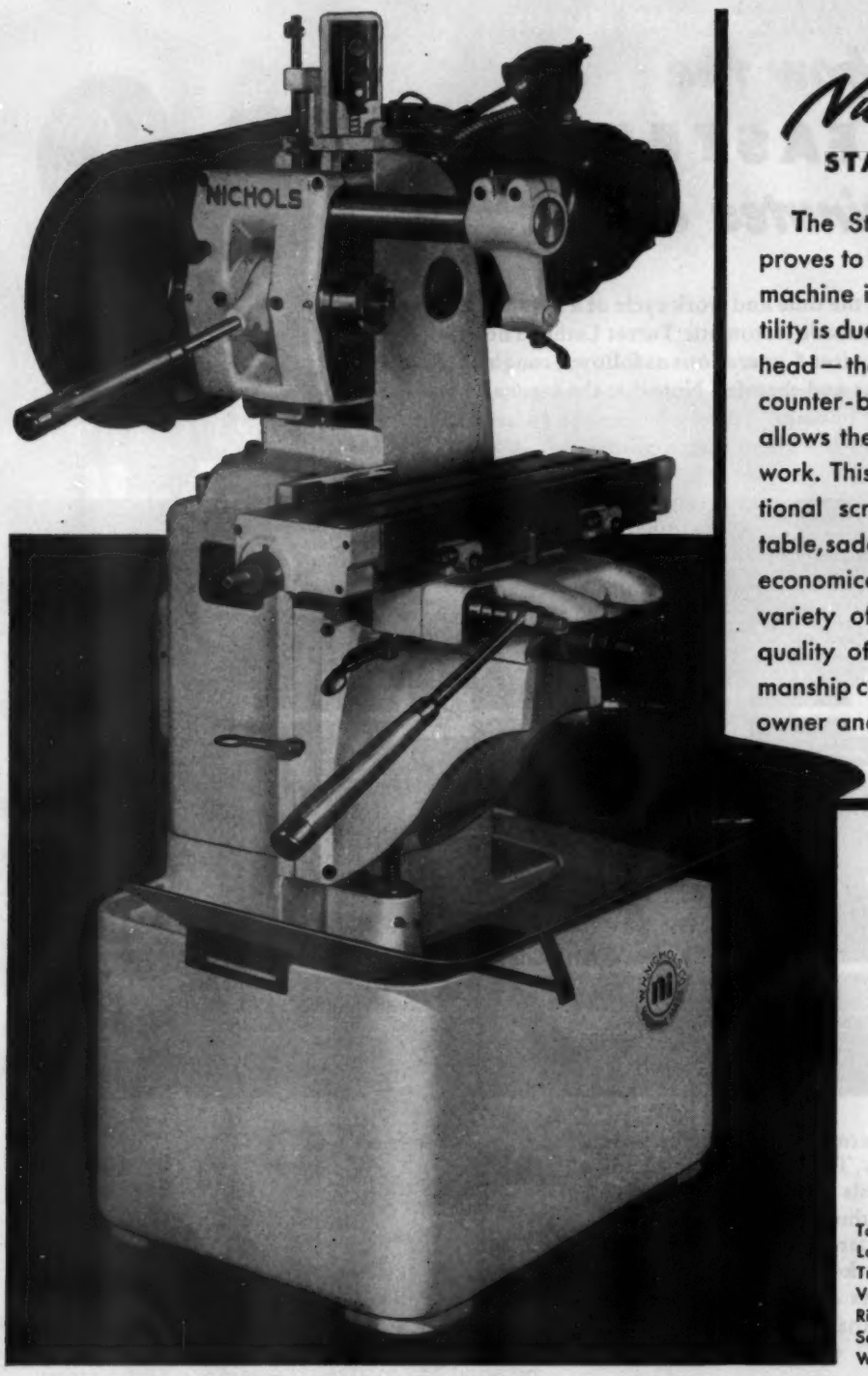


# *Nichols Miller*

## STANDARD MODEL

The Standard Nichols Miller often proves to be the handiest (and busiest) machine in the shop. Its unusual versatility is due to the "rise and fall" spindle head—the spindle being mounted in a counter-balanced sliding head which allows the cutter to be brought to the work. This unique feature, plus conventional screw or lever movements of table, saddle and knee, guarantees fast, economical production on the widest variety of parts. And the unexcelled quality of Nichols' design and workmanship commands the respect of every owner and operator.

*"the miller that uses its head!"*

**CONDENSED SPECIFICATIONS**

| | |
|---|---|
| Table Working Surface | 6¼" x 21" or 30" |
| Longitudinal Travel | 10" or 19" |
| Transverse Travel | 7" |
| Vertical Travel—Knee | 13½" |
| Rise and Fall of Spindle | 4½" |
| Selective Speed Ranges | up to 5000 R.P.M. |
| Weight | 1250 lbs. |

*Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie, "the Miller that Uses its Head" is available for free showing. May we reserve it for you?*

**ASTE SHOW**
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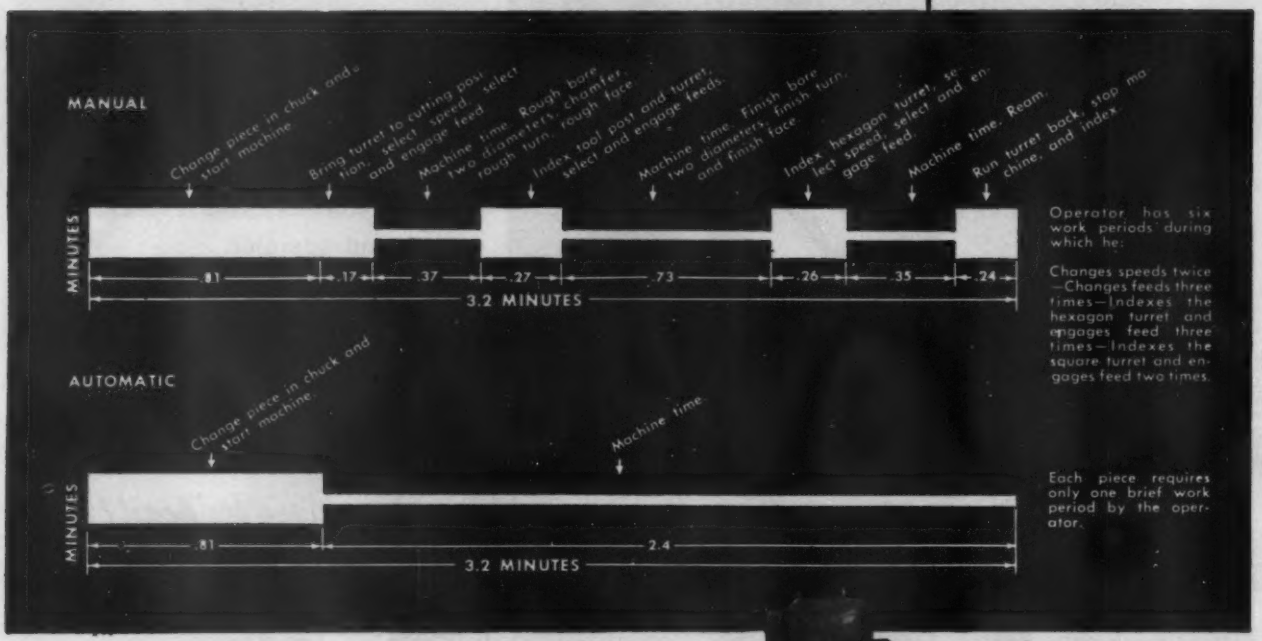
**WHITE PLAINS, N. Y.**

# how the GISHOLT FASTERMATIC saves man-minutes and money!

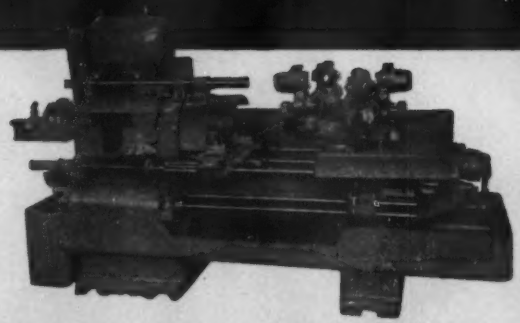
**Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.**


MANUAL
Change piece in chuck and start machine.
Bring turret to cutting position, select speed and engage feed.
Machine time. Rough bore, two diameters, chamfer, rough turn, rough face.
Index tool post and turret, select and engage feeds.
Machine time. Finish bore two diameters, finish turn, and finish face.
Index hexagon turret, select speed, select and engage feed.
Machine time. Ream.
Run turret back, stop machine, and index.
MINUTES
.81
.17
.37
.27
.73
.26
.35
.24
3.2 MINUTES
Operator has six work periods during which he:
Changes speeds twice—Changes feeds three times—Indexes the hexagon turret and engages feed three times—Indexes the square turret and engages feed two times.
AUTOMATIC
Change piece in chuck and start machine.
Machine time.
MINUTES
.81
2.4
3.2 MINUTES
Each piece requires only one brief work period by the operator.

That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

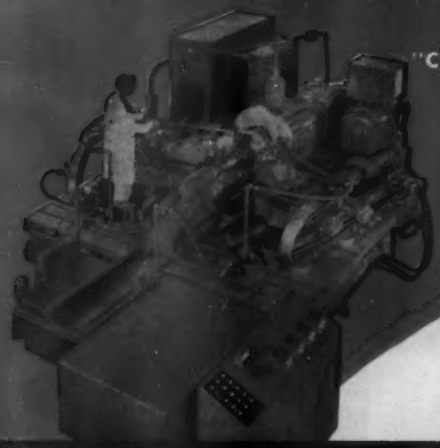
There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.



**THE GISHOLT 1-F FASTERMATIC**—*smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.*

**GISHOLT MACHINE COMPANY**
**Madison 10, Wisconsin**

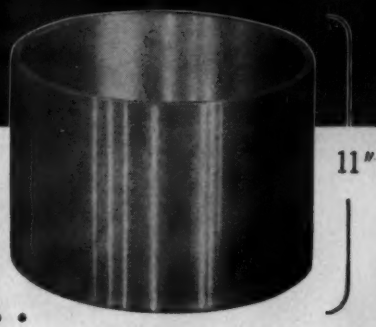
**THE GISHOLT ROUND TABLE** *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*



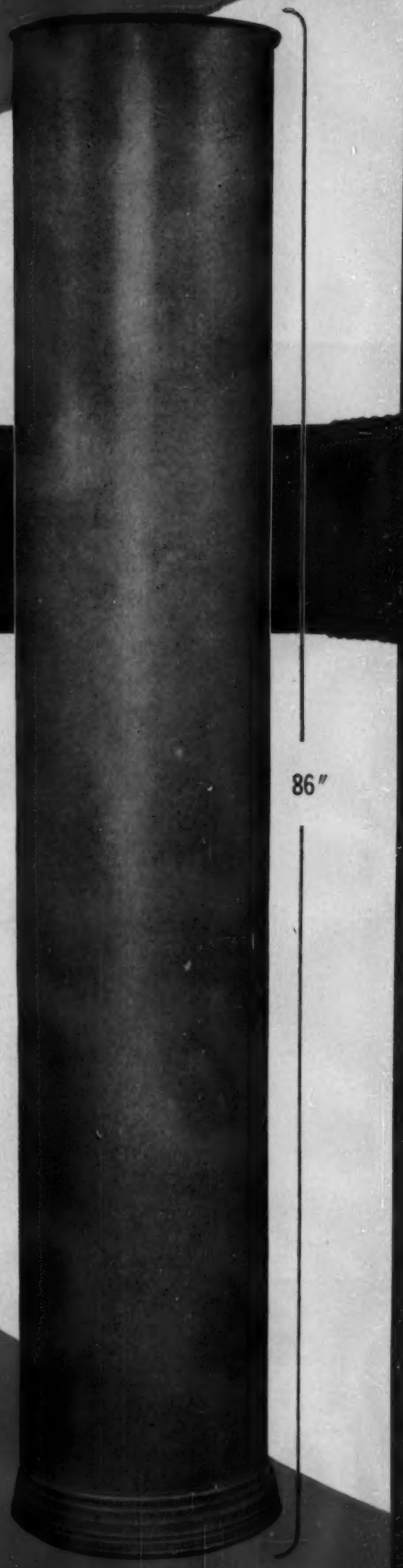
"CHIPLESS MACHINING"
Cincinnati 42" x 30"
Duplex Hydrospin

THE CINCINNATI

# Hydrospin




*roll-flows this 11" blank . . .*




*into this 86" seamless steel tube*

**JOB DATA:** The blank is a billet-pierced, ring-rolled forging of annealed AISI 4140 aircraft quality steel, machined to 11" long x 13½" I.D. x ½" thick. The ring, slipped onto a straight, hardened mandrel, was *roll-formed* to the desired dimensions in less than 25 minutes (floor to floor time). "*Chipless machining*" by the Cincinnati Hydrospin reduced the wall thickness 92%. The finished tube is 86" long x 13.500" I.D. x 0.040" thick. Hardness increased to Rockwell C 39. Tensile strength after Hydrospinning is doubled. I.D. finish is 10 micro-inches and O.D. finish is 30 micro-inches or better.

**HYDROSPINNING** is the first economical method available for producing precision, thin-wall seamless tubing. Let a Cincinnati Milling field engineer give you detailed information. For a description of the Hydrospinning process and machine specifications, write for Bulletin M-1873-1.

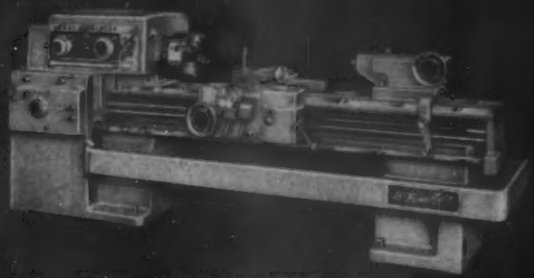
CINCINNATI **Hydrospin**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.

LODGE & SHIPLEY

*Powerturn*

***the "stand-out" lathe***



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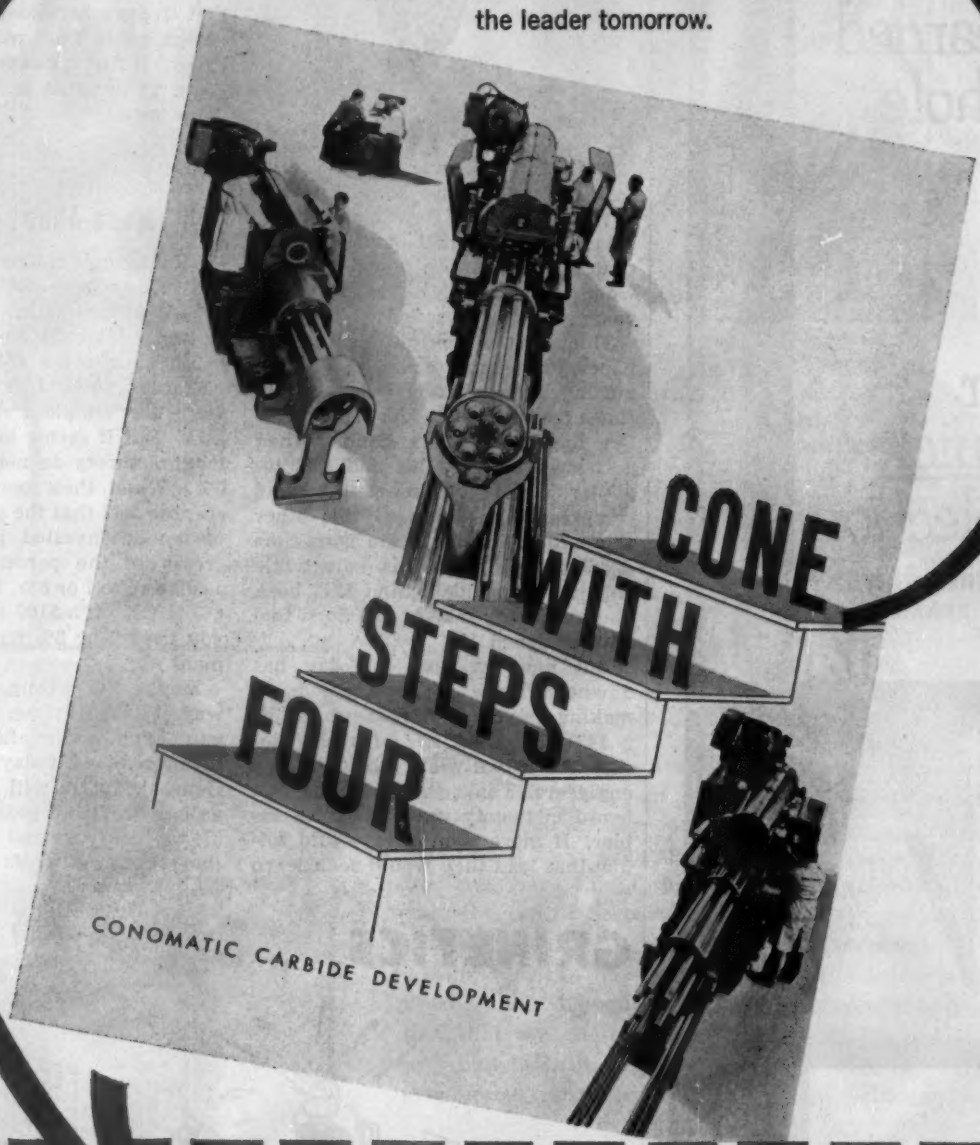
**Acclaimed at the Machine Tool Show, these new lathes combine traditional Lodge & Shipley accuracy and strength with new features. These features give still greater precision and operating convenience whether for production or general purpose turning.**

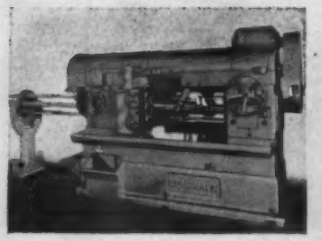
**We'll help you determine the part POWERTURN can play in your lathe operations. Address: The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.**

*More than ever before, your LODGE-ical choice is...* **Lodge & Shipley**

If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.




Write for your free copy of this important booklet today!



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for lower cost per reamed hole

for quick selection

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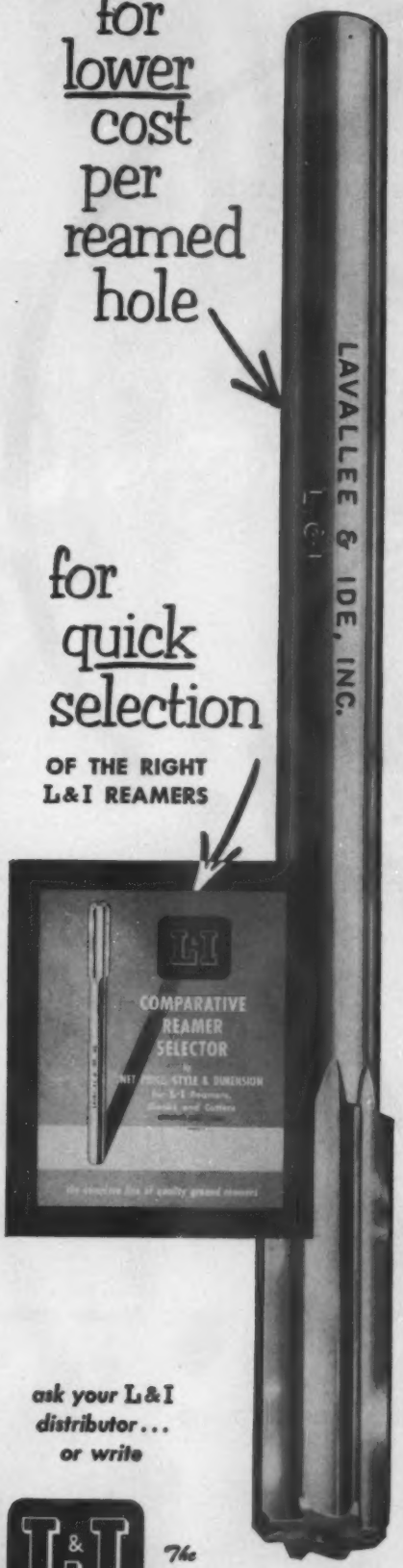


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L&I The Reamer Specialists

LAVALLEE & IDE, INC.
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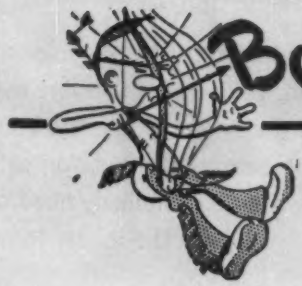

# Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

## Millenium

"The so-and-so who designed this thing ought to have to just try to put it together." How many times have we heard that—and stronger things—said on the assembly floor when some new product was just getting into production?

Things often look quite simple on paper, but when it comes to actually putting them together a man sometimes feels he needs four hands with ten fingers on each hand. When you have to hold this and this together while you insert this, and compress this spring so this other thig will go in, and at the same time drop this pin into this hole while engaging this lug behind this boss, you get pretty mad at the durn fool who designed it.

But now, at last, the day has dawned. I see in your article on making cameras (*AM*—Sept 26 '55, p 145) that pilot lots of a new design are actually assembled by the engineers. That's the best news I've heard in twenty years as an assembler. If more companies would follow that lead they would soon learn that it pays handsome dividends to design parts that will go together easily. If Ansco can do it with something as fussy as a camera, so can other people.

A L Auer
*Racine*

## More About Money

Mr R J Lemp's explanation of where the money goes (*AM*—Nov 7 '55, p93) is alright as far as it goes, and certainly I would not begrudge the manufacturer his 6%, nor the retailer his 25%. If the explanation were that simple I should have no kick. But it seems to me that most manufacturers do not stick to their 6%. When their costs go up they seem to feel that the greater amount of money invested justifies an increase in the percentage, so they push it up to 7 or 8%. In other words, 6% is OK on a $100 investment, but you need 7 or 8% on a $500 investment.

Maybe I'm wrong, but that's the way it looks to me. How else can you explain the fantastic profits being realized today? I hear that General Motors will make a billion dollars profit this year and sell about 3½ million cars and trucks. Maybe the percentage profit per car is not

## GRINETICS

By D G SMITH

CHAIN REACTION

FOUNDRY

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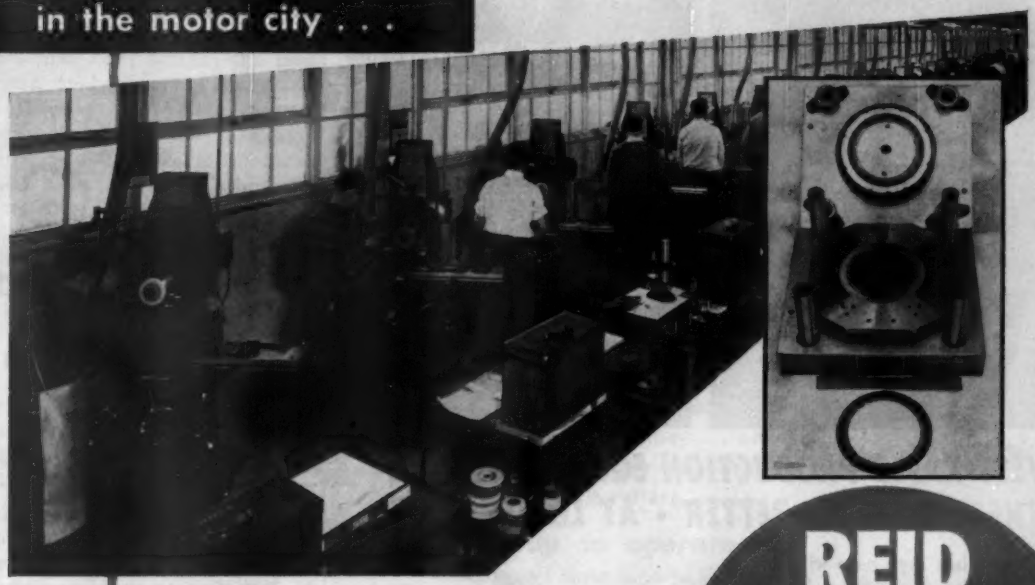
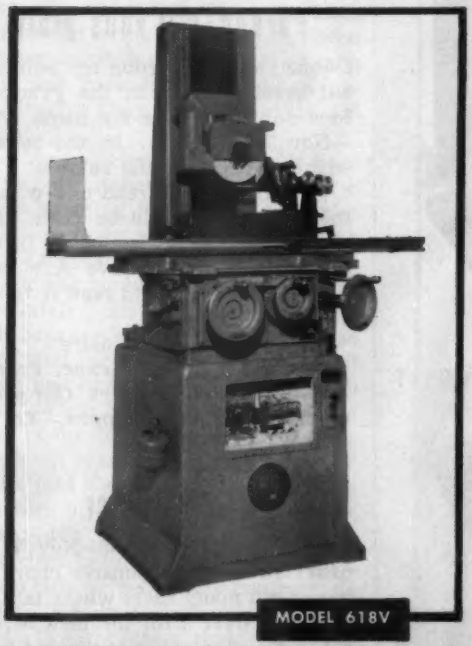
in the motor city . . .



# REID GRINDERS set the STANDARD for ACCURACY



MODEL 618V

**In Detroit, at Commando Tool and Die Co., positive accuracy is a must in grinding the high-production tooling necessary for today's automobile and aircraft production race. Commando and many other shops in the area have found that Reid Surface Grinders provide the built-in accuracy that spells top performance year after year.**

**You, too, can have the precision, the better surface finishes, the dependability and convenience of operation that are engineered into every Reid Grinder. So why not plan now to replace the over-age surface grinders in your plant with new Reid Grinders.**

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BEVERLY, MASSACHUSETTS

what products do you make that need *permanent*

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**NOBLEWEST RAPID PRODUCTION EQUIPMENT WILL MARK THEM FASTER • BETTER • AT LOWER COST**

Because Noblewest has kept pace with industry's demand for constantly higher marking speeds and lower costs per unit marked . . . Noblewest is, today, the world's leading manufacturer of rapid precision equipment for the permanent marking of metal, plastic, hard rubber, wood. Model 157 (illustrated), with new improvements, can be tooled for marking many sizes and shapes of pieces.

Noblewest is equally famed for fine marking dies . . . made to the most exacting standards of quality and with the all-important skill and know-how of master craftsmen. For good impressions and long service, only the very finest of steel, carefully heat-treated, is used.

Whatever your needs for marking, Noblewest makes the machines, tools and dies to do the job faster, better, at lower cost. For complete details write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

A MARK IS ONLY AS GOOD AS THE DIE THAT MADE IT

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NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING | NUMBERING | GRADUATING | EMBOSSING | DIES-FIXTURES

excessive, but I always thought that the more you made the cheaper you could sell. If they cut their profit in half they would still make a half-

billion—a comfortable sum in anybody's language. Then allowing the dealer the same percentage as before, the customer would still get a substantial advantage and more people than ever could buy cars.

But despite the wonderful, cost-cutting automation devices you have shown in recent articles, the prices of 1956 cars are higher than ever. It just doesn't make sense.

Geo Heptinstall
*Cleveland*

## Pardon, s'il vous plait

I hope you will pardon my pointing out several errors in the Practical Idea published over my name (*AM*—Nov 7 '55, p159). In the second equation you give the value of q as $t + t'$. This should read $p + p'$, and the sine of p' should be given as b over R – a, not R – a over b. In the next equation, you have $A = x - (A + b)$. This should read $A = x - (a + b)$.

Ch Minaire
*St Etienne, France*

*Author Minaire is correct. Our proof reading must have slipped.*—Ed.

## Talk It Over

Item 490 of Tips (*AM*—Nov 7 '55 p154) strikes a responsive chord. I have seen many cases where talking problems over with the men before making a change has prevented hurt feelings and trouble.

I recall one case in a large railroad shop where the super had a very good turret-lathe man working on a not-so-good machine. Had been running it for a long time and had become accustomed and attached to it. He got more work out of it than any man before ever had.

The super had seen a newer and

better lathe in another shop and felt he should order one for his own shop. Of course, it was his job to buy what he felt was best, whether the operator liked it or not. Many supers would have bought the new lathe and told the man he could run it—or else.

Instead, this super took the man in his car to a shop about 100 miles away to have a look at the new machine. He told the man he'd like him to look it over and let him know what he thought of it. After introducing him to the foreman and operator, he left him to observe and talk it over. The operator evidently did a good selling job because the visitor became enthusiastic over the new machine and talked about its good points all the way home.

Another, and more unusual case was when the foundrymen in a large plant threatened to leave for another city about 50 miles away, where they had been offered more money and what was described as good living conditions. The general manager took three representatives of his foundrymen to the town that was trying to pirate them. They did not call at the plant, but he drove his men around the outside, then took them to the section of the town where they would be supposed to live so as to be near the shop. They found that living conditions had been misrepresented, and the three men reported back to their fellows accordingly. They all stayed at the old plant.

A neven more striking case happened a number of years ago at a large printing house. All the print shops in town went on strike—with one exception. There, the boss was away and could not be reached immediately. His men stayed on the job because he hed treated them so well that they would not strike until they had had a chance to talk with him. When he came back, they told him of the union demand for a 40-hr week—it was many years ago.

He told his men it was impossible for him to grant their demands just then. His press capacity was not sufficient to turn out the publications for which he was under contract, on time. He had, however, ordered new, faster presses that would enable him to grant the 40-hr week as soon as they were delivered. He had the confidence of his men and they stuck to their jobs.

These three incidents show that it pays to have the confidence of your men and consult with them whenever possible.

Fred H Colvin
Point Pleasant, NJ


*So Efficient—*

OLIVER ACE

Universal Tool and Cutter Grinders

The Oliver ACE grinds cutters of all types—increases productivity—and offers unsurpassed advantages for *your* toolroom. Four decades of proved dependability makes possible these 4 most important advantages:

1 **Easy to operate**—the ACE requires no computation . . . direct reading for clearances . . . reduces fatigue . . . eases operators' jobs in grinding the most difficult cutters.

2 **Speedy to operate**—the ACE cuts time lags to the bone . . . simplicity of design and operation makes economy of motion and fast grinding certain.

3 **Precision guaranteed**—the ACE handles a wider range of cutters than ordinary cutter grinders (includes high speed and tungsten-carbide work) . . . only two simple fixtures required.

4 **Economy assured**—the ACE is unmatched for its unexcelled ease, speed and precision of operation. It is not only easy to set up but needs only a small amount of floor space and requires less outlay in dollars.

Direct Reading for Clearance

—Reduces Fatigue
—Eases Operators' Jobs

Time proved, dependable and soundly engineered — the Oliver ACE Universal Tool and Cutter Grinder is built to give you many years of unsurpassed service. Like thousands of others, find out for yourself why the Best Way . . . is the Oliver Way.

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular wood saws.

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MACHINE TOOLS by OLIVER include:
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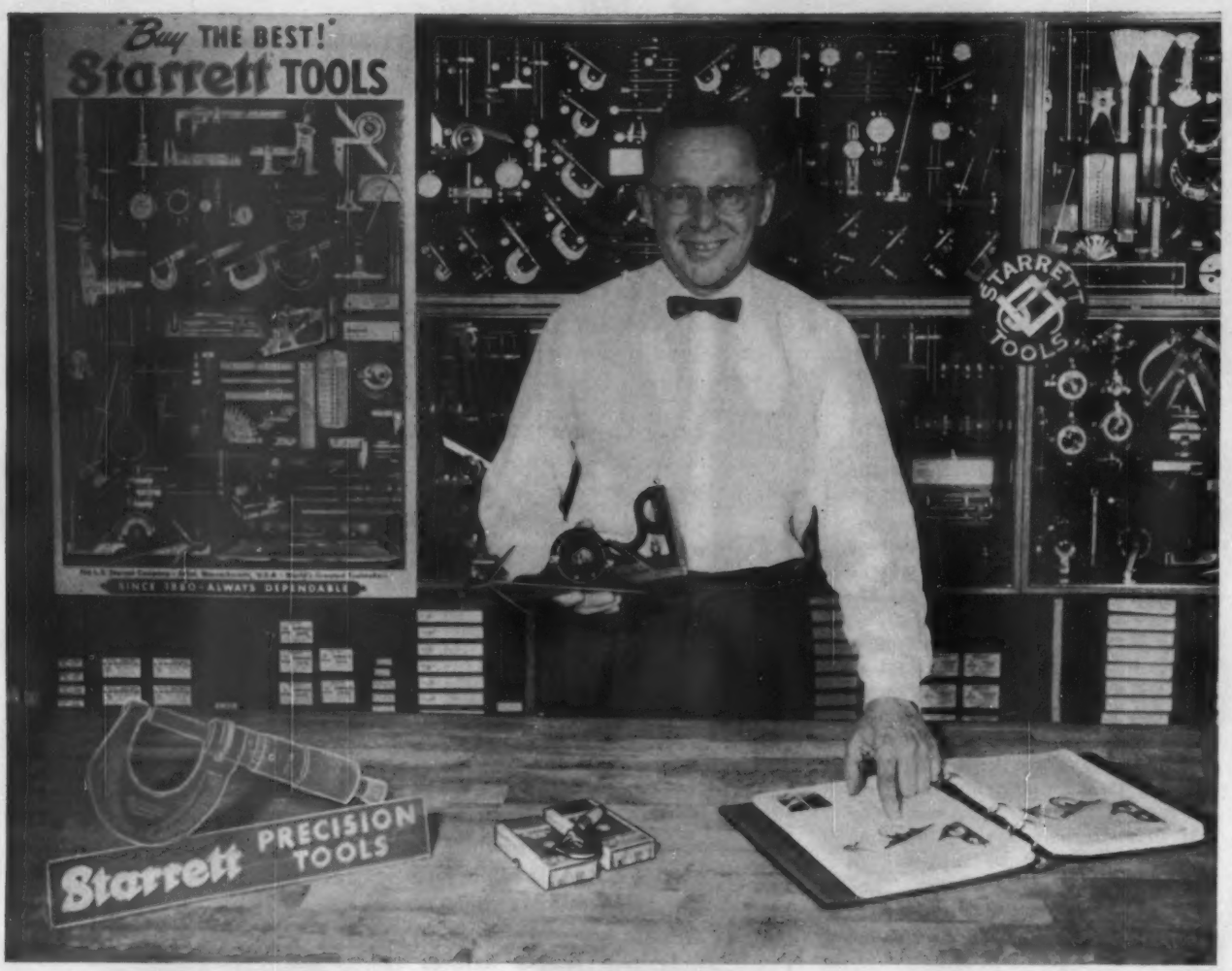



# NAME IT...AND HE HAS IT

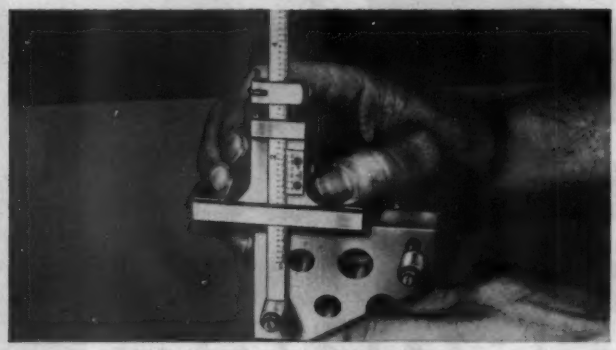
## Your Industrial Supply Distributor Helps Maintain The World's Largest Tool Crib

Typical of the service offered by your Industrial Supply Distributor is the complete stock of Starrett Tools which he carries for your convenience. Name any one of the more than 3000 items in the big, new Starrett 75th Anniversary Catalog and in a matter of hours he will place it in your hands.

Your Industrial Supply Distributor is much more than a convenient and reliable source of supply for the finest in tools and materials. His service saves your time, simplifies purchasing, saves shipping costs, correspondence and multiple paper work.

Not the least of his valuable services is the friendly way he will call to your attention Starrett Tools like those on the opposite page . . . tools skillfully designed to help you do essential jobs in an easier, more accurate, more economical way.

**COMMEMORATING 75 YEARS** THE L. S. STARRETT COMPANY 1880 75th ANNIVERSARY 1955 STARRETT TOOLS **OF PRECISION TOOLMAKING**

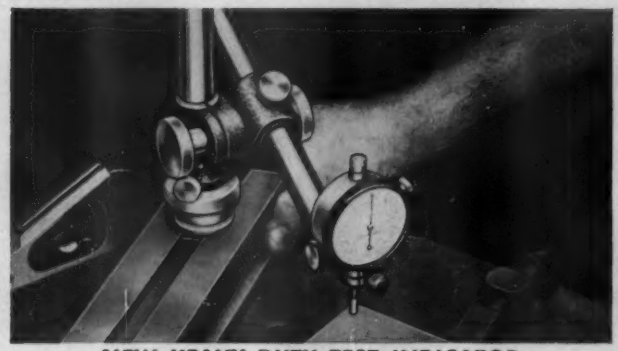


**NEW VERNIER DEPTH GAGES**

No. 448 Series have extra capacity with new, longer blades permitting full 6″ or 12″ readings. Available with 6″, 12″ or 6″ and 12″ blades. English, Metric or English and Metric measure.

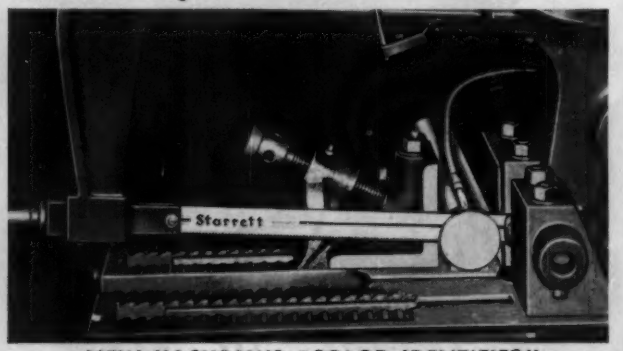
**NEW DIAL INDICATOR SET**

Set No. 253 fills most indicator needs for small shops or big shop departments. Three indicators in handy mahogany case include .001″, .0005″ and .0001″ graduations; .025″, .125″ and 1.000″ ranges.



**NEW HEAVY DUTY TEST INDICATOR**

No. 675 with extra rigid construction has universal adjustments for quick positioning. 10″ base, 10½″ base post and 8¾″ gage rod give it unusual stability and working range. Indicator normally furnished reads 0-25-0, graduated .0005″, range .125″. Others available.

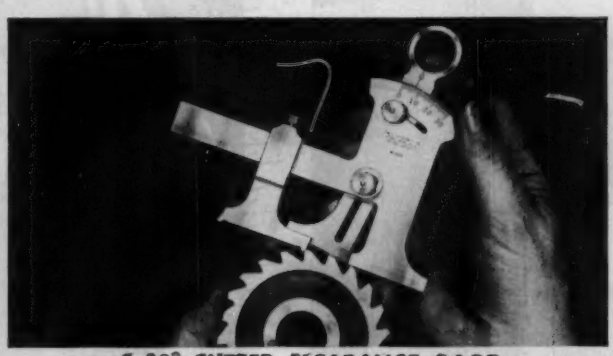



**NEW HACKSAWS "COLOR IDENTIFIED"**

New Starrett Hacksaws are Color Identified for quick selection and Production-Proved to give you the performance you need for any metal cutting job. Starrett also makes Band Saws, Band Knives and new Safe-Flex® Hole Saws.

**TUBULAR MIKES FOR BIG WORK**

New sizes now range up to 168 inches — bow or bar types with fixed, sliding or interchangeable anvils — also dial indicator heads or special contacts. Light yet rigid for perfect balance, sensitive feel and easy handling.



**0-30° CUTTER CLEARANCE GAGE**

No. 459 makes it easy to get correct clearance angles on cutters, end mills, saws and broaches. Ends guesswork, insures maximum cutting efficiency. For clearance angles up to 30 degrees, diameters up to 30 inches.

**BIG NEW CATALOG NO. 27**

New 75th Anniversary Catalog describes and illustrates the complete Starrett line. Ask your Industrial Distributor or write for free copy. Address Dept.

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**SINCE 1880**
**WORLD'S GREATEST TOOLMAKERS**

**THE L. S. STARRETT COMPANY**
**ATHOL, MASSACHUSETTS, U. S. A.**

# NEW
# design freedom

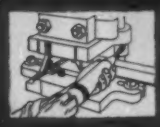
FEATURED IN THE EXPANDED DANLY DIE SET LINE

**NOW** Danly meets or beats all ASA standards . . .

. . . the world's broadest die set line. There's no need to compromise between the standard die set you can get, and the one you really want. The new line of Danly Standard Die Sets, with extra-wide and guide post dimensions that exceed current ASA specifications, is under the ASA standards. Front to back die space is increased from edge of bushing to front of die set.

In addition to offering a complete selection of ASA standard die sets, Danly presents the Danly Standards proved popular over the years . . . all available from stock at your nearest Danly Branch. You can be sure of meeting all your die set needs as Danly . . . whether ASA standard or Danly Standard.

**NOW** Danly offers you these additional features



**Self-Aligning System For Shoulder Bushing Sets.** The new Danly die set features assures proper die, section interchange, proper relocation upon regrind or grind.

**All Machined Surfaces Ground On New Danly Die Sets.** Horizontal surfaces, including top of punch holder and bottom of die holder, are ground to the same exacting precision as the inner die set surfaces.

**Integral Welded Shanks.** 100% steel on all shank sets regularly furnished with standard Class guide strength and rigidity. Class connections in punch holder have less tendency to weaken set.

DANLY

DIE SETS AND
DIEMAKERS' SUPPLIES

DANLY MACHINE SPECIALTIES, INC.

# Spot News of Metalworking...

- **Are small users being squeezed out on scarce steel items?** One such user of hot-rolled plate says steel companies' "informal allocations" will force him out of business, and has appealed to Washington for help.

- **Aircraft unions are all bargaining for the same basic demands** — for the first time. The demands: union shop and some form of employment security. A UAW-CIO official says "aircraft workers are probably more in need of GAW than any other workers in the UAW-CIO."

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One provision in the forthcoming Pentagon machine tool directive (see pp 107 and 111) will deal with packages of idle military tools. It will reportedly allow more liberal inter-service interchange of the tools — even to the point of breaking up mothballed tool packages — a hitherto forbidden practice.

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- **New testing equipment checks stainless steel tubing at 250 fpm.** Audible and visible signals indicate presence of internal or external scratches, dents, cracks, flaws, and weld defects. Instrument also indicates changes in wall thickness as little as 3%, along with changes in surface finish and differences in the chemistry of austenitic stainless steels.

- **Aircraft companies will spend $1.5 to $2 billion on plant expansion** and improvements in the next decade. That's the prediction of Lockheed President Robert E Gross.

- **It would take only five atom bombs to knock out 60% of U S capacity** to make electronic instruments, Illinois Tech's R L Janes told the recent A-Bomb and Industry Conference there. He didn't name the target areas.

- **Complete new lines of cars every year is a growing Detroit rumor.** This comes right on top of autodom's every-two-instead-of-every-three-year change trend. Auto people figure an expanding market warrants it.

- **Bomarc guided missiles will be made in Denver if Boeing gets the contract.** The Denver Post quotes a Boeing official as saying the company will build a $60-million plant near Rocky Mountain Arsenal.

---

Germany plans to build four types of military aircraft soon: Flugzeugbau Nord Gmbh the Noratlas transport; Focke-Wulf the P149 trainer; Dornier the Do27 multi-purpose Army plane; and Heinkel and Messerschmidt the Fouga Meister turbo trainer.

---

- **One way to stave off GAW in your plant:** adopt profit sharing plans that incorporate weekly or monthly benefits to laid-off employees.

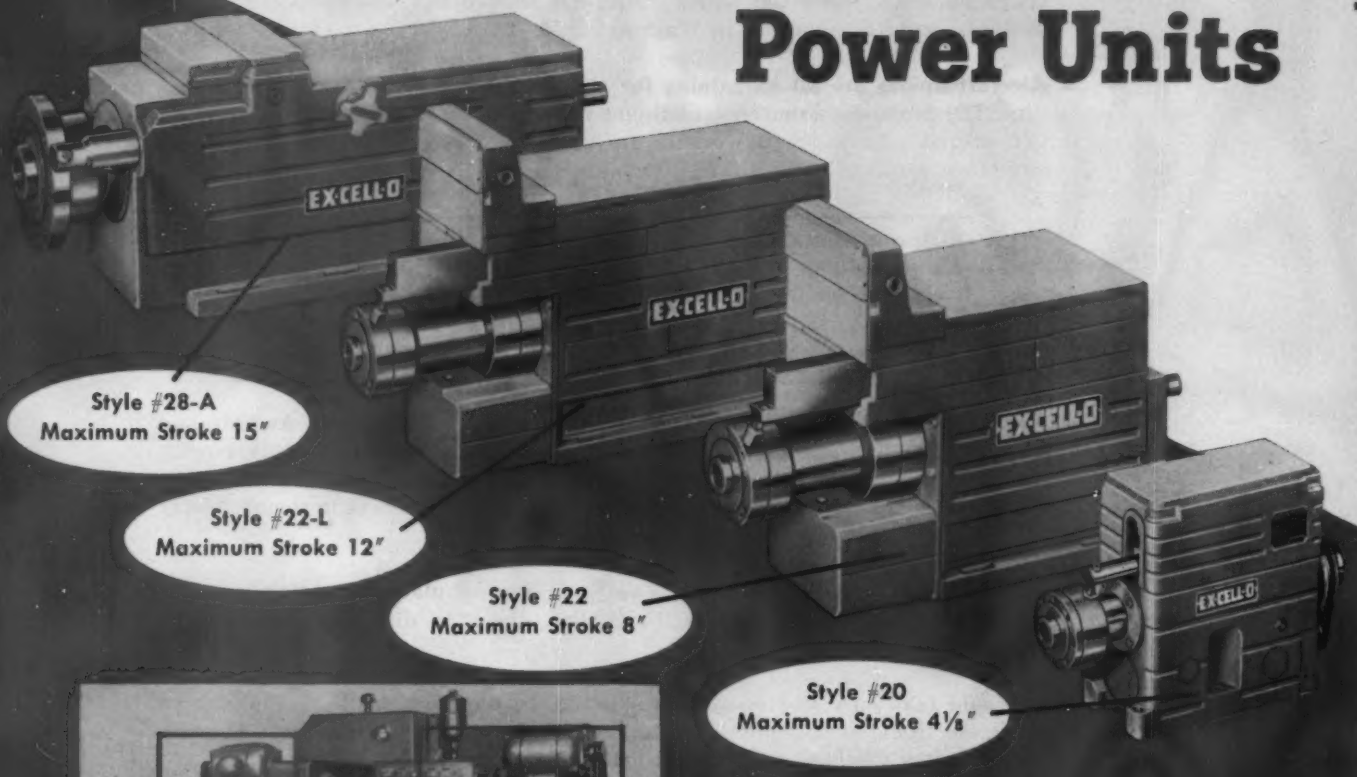
- **Plastic tools and dies are saving up to $250,000 in a single operation,** a plastics consultant told the American Society of Body Engineers recently. Example: auto tail light stampings are made in 5 operations instead of 9, and short-run stampings are made on plastic dies with less servicing than is needed to spot-in a metal tool.

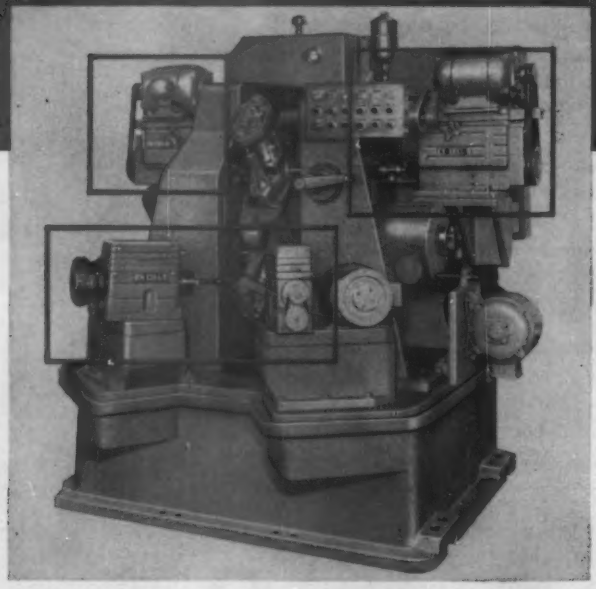
- **Austrian machine tool builders have formed an association** that will, among other things, promote export business. So far this year, Austria has exported about half of its machine tool output.

FOR AUTOMATIC CYCLES IN PRODUCTION MACHINES:

# Ex-Cell-O Quill-Type Power Units

XLO
EX-CELL-O for PRECISION



**This special machine with automatic indexing fixture core-drills piston pin holes and drills angular oil holes. It uses six Ex-Cell-O Power Units (shown without belt guards) operated from a central push-button station.**

Ex-Cell-O Hydraulic Power Units feed and rotate cutting tools in easily controlled automatic cycles. They actuate single tools or multiple spindle heads for such operations as drilling, reaming, counterboring and spot-facing. Hydraulic operation provides smooth, powerful movements.

A machine utilizing Ex-Cell-O Power Units can be very simple, with manual loading and clamping. Or it can be designed with work handling equipment for automation . . .

For complete information, including specifications and installation drawings, ask your Ex-Cell-O Representative or write Ex-Cell-O in Detroit.

**EX-CELL-O CORPORATION** DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

55-13

# Washington . . .

### *Reserve tool freeze . . .*

**As this page went to press,** there was still no official announcement from the Pentagon on the Reserve Tool Program's future. A new policy directive on tools is in the works and should be released this month. But it seems certain the Defense Dept plans to scrap the reserve weapons capacity scheme.

**A freeze has been placed on new tool** orders with fiscal 1955 money. Up to now, only about $22 million worth of contracts has been awarded from the $100-million fund. Some $50 million worth of additional orders was about to be placed by the Air Force when the freeze was imposed.

**In addition,** the Defense Dept has made no move to allocate money to the three services from the $100-million fund appropriated for fiscal 1956. Right now, it seems money will be allocated.

### *Tools for current use . . .*

**The concept of deliberately creating standby arms** capacity is being shelved. The tipoff comes from talk that the Defense Dept will now allow the services to put the long lead-time reserve tools ordered earlier this year into production when delivery is made.

**What's more,** the upcoming policy directive will probably give the Air Force a green light to place the $50 million worth of tool orders now suspended. But the equipment will be put into current production, rather than stored for standby use. The new tools will be used to speed up production of B-52 bombers and F-101 and F-104 jet fighters.

### *Switch in defense policy . . .*

**The turn-around on reserve tools** stems from the Defense Dept's recently adopted "Joint Mid-Range" War Plan. Purpose of this new plan is to resolve the long-simmering, inter-service squabble over whether the next war will be a long one or short one. Previously, each service went its own way on strategic concepts — the Army, planning for mobilization up to three years, the Air Force for six months or less.

**One Pentagon official** calls the new plan "an agreed vehicle on which budget planning and peacetime financing will be based." Its exact contents, of course, are top-secret. But it's known the plan points out that the "major impact" of the next war will be in the early period. This is a clue toward more emphasis on procurement of weapons and equipment to have on hand for the initial phases of a war, less on keeping a broad base of production lines ready to produce in quantity.

**The thinking is this:** to the extent you shorten the time element in a war, the value of industrial capacity to produce depreciates. So strategic significance shifts to the quality of your forces.

### *Effects of policy shift . . .*

**All this means a greater emphasis** on research and development, a speedier transition from prototype weapons to heavy volume production. The new concept won't have much effect on the level of procurement, however, but there will be a step-up in replacement of equipment.

**While the basic thinking** about reserves is changing—in industrial capacity, weapons inventories, materials stockpiling, manpower, and the like—don't expect to see a complete overhaul of current programs. For instance, there's no thought of suddenly dismantling stockpiles and reserve industrial capacity. The new policy boils down to this: there'll be no expansion of reserve capacity and no dissipation of what we have now.

**Says one official:** the cost of buying new facilities is very high; the cost of protecting and preserving them is cheap. Besides, there have been mistakes made before in estimating how long a war will last. The military planners are still faced with chances that a new total war will not be decided in a hurry, that limited "brush-fire" conflicts may still erupt as in Korea. So the new policy will not mean rapid changes in defense programs.

### *GM investigation . . .*

**Senate antitrust probers** so far have found little to indicate antitrust violations or monopoly in General Motors though most witnesses fear GM getting bigger and bigger in more industries.

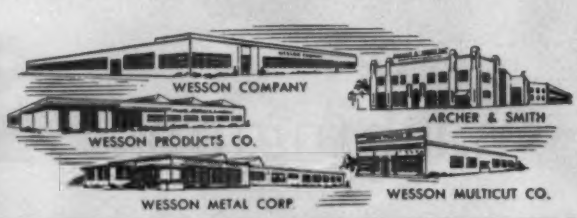
**One possible monopoly angle** turned up is several months old: that the Justice Dept is looking at GM's bus-making to see if there's an antitrust case. The Committee heard testimony that several bus manufacturers—specifically the Twin Coach Co and ACF Brill Co—were driven out of business by GM's dominance. GM accounted for 80% of the buses built in the first nine months of this year; in 1950, GM built about 50%.

**Another manufacturer,** Thomas P Butler of the Flxible Co of Ohio, told the committee GM blocked sale of GM diesel engines to Flxible in 1952—because Flxible's buses competed with GM's.

**GM's purchase of the Euclid Road Machinery Co** in 1953 got a thorough going over, because the deal put GM in the earthmoving equipment industry. Former Euclid President Raymond Q. Armington, however, said his company could not have survived without joining a big company like GM.

**Turning to the automotive field,** several independent auto parts makers and wholesalers said GM's drive to get 50% of the replacement parts market is freezing them out.

carbide NEWS




# Grade 26 Cuts Tool Costs 88%

***New wide range grade and holder boost pieces/grind from 85 to 800***

A reduction from approximately four cents to less than ½ cent per piece in tool cost has been achieved in the machining of single-throw Arma Steel crankshafts by a midwestern machine company. These savings were obtained despite an increase in blade cost of 41% over the style previously used.

The savings were achieved in two steps. The first revealed that Wessonmetal Grade 26 would out-perform all other grades by an average of 50 pieces per cutting edge. The next step was to adopt a Wesson Multicut holder. This helped to increase tool life to 200 pieces per cutting edge. With four edges per insert, life is 800 pieces per grind, as against the original 85. Part of the overall increase is due of course to the rigid construction and support provided by the new holders.

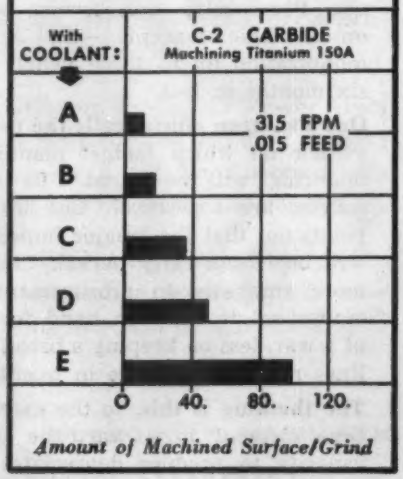
*26 Carbide slashed tool cost from $0.038 to $0.0043 in machining flywheel and pulley ends of this single throw crankshaft.*

Operations consist of rough and finish turning of the flywheel and pulley ends of the 220 Brinell steel crankshaft. Machining is being done dry on a 20 hp New Britain tracer lathe at 1210 rpm and .014" feed. Depth of cut averages ¼ to ⅜-inch.

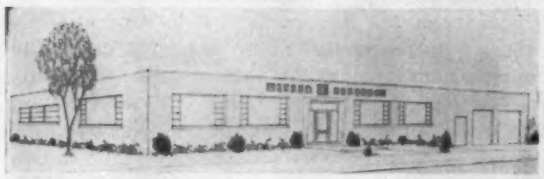
In achieving the savings, no changes were made in speeds, feeds or depths of cut.

## Tool Hints...

The cost-cutting story told above re-emphasizes the necessity of studying ALL the factors contributing to tool performance if maximum economies are to be obtained. In this case, the answers lay in (a) the carbide metal and (b) the tool holder. Sometimes it may be the coolant which will provide a major saving. In the chart below, for instance, are shown relative lives of the same tool material at the same speeds and feeds using five different types of coolant in the machining of Titanium 150A! A C-2 grade of carbide was used and feed was .015" at 315 ft. per minute.




## New Carbide Research Center



story structure has been completed adjacent to Wesson's Detroit plant.

The new research division will supplement the basic metals research carried on in Lexington, Kentucky at the new metals plant of the Wesson Metal Corporation, now producing all Wessonmetal carbides.

The new research division is under W. B. Bader, Vice President. It is being completely equipped for fabrication as well as testing of new tool designs. Lathes, milling machines, grinders, etc., are included in the equipment.

New concepts in carbide boring and milling cutter designs may result from new research programs now under way at Wesson. Included are milling cutters utilizing "throwaway" carbide blades.

To house Wesson's expanded product development and tool application research facilities and staff, a new one-

tools Wesson carbide Wessonmetal

WESSON COMPANY
DEPT. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

# Detroit . . .

## Tooling up as much as 100%?

**A swift poll of members** attending the 10th annual meeting of the National Tool and Die Manufacturers Association held in Detroit in early November, revealed that all the shops in the Detroit area are talking in terms of a tremendous pick-up in tooling in 1956, with some shops anticipating an increase of from 50 to 100% over 1955.

**Detroit people in the industry** predict confidentially that tooling will "spill out of Detroit and spread all over the country" before the end of 1955.

**Orders for the upcoming (1957) auto models** — which have previously been noted as "tremendous" —are reputedly the biggest ever.

## Color TV expects a boom . . .

**Color television** — an industry which has been confidently predicting its own rise to the top for several years without ever making it — promises to hit the long-awaited boom trail within the next two or three years.

**Members of the metal stamping industry** — who find a profitable market in TV parts — expect the color television market to hit the 200,000 mark by the end of 1956. By the end of 1958 some people in the metal stamping field expect demand to be well enough established that they will be in a position to supply a potential market of a million or more sets a year.

**With black-and-white TV sets** tabbed at about 35 million already in use — color TV has a long way to go.

## Long-Range Crystal Balling . . .

**Auto people are now equipping themselves** with forecast material—not for next year—but for the year after. One of the informed people in the industry went way out on a limb the other day and insisted that the 1957 sales potential for automobiles will be "at least 8-million cars."

## Sharp Break for '57?

**He based his forecast** on the "sharp break in the traditional engineering and styling that is coming in 1957." This so-called "sharp break" that he speaks of will include more glass than you have ever seen before; glass curved and wrapped around not only a windshield, but up into the roof on both windshields and doors; a much lower hood (fuel injection on some models will chop seven inches off the hood height); smaller wheels . . . and several other items of big import.

**Significantly,** this same informed source waved aside the query on what the sales of 1956 cars would approximate, citing the political conventions and the election late next year as clouds that fogged his crystal ball.

## American Motors moves out . . .

**American Motors Corporation** will jump into the fleet-owned and taxicab lines in 1956 with an air-conditioned Rambler. Already several fairly large customers are interested . . . with orders reportedly following up inquiries. Taxicab companies are especially interested. The Rambler is no longer a "small car"—at the press showing in Wisconsin, Nash put six big men (six-foot-three or taller; 240 lbs each and up) into a 4-door Rambler without using a shoe horn or slamming the doors on arms and legs.

**Air-conditioning units in the Rambler** are going to make the big difference. Nash air conditioning is well below competitive prices and is a neat, packaged unit that fits behind the dashboard. And its design—all new this year—will turn many a head Nash's way. Nash expects to more than double its output of Ramblers in the 1956 model.

## New plant tooling . . .

**Ford's announcement** that it will build a 1.2-million-sq-ft plant in Columbus, Ohio—beginning construction this year and finishing by mid-1957—will open up another multi-million dollar tooling market.

**Ford people have stopped talking** about the "price" of a new plant, real-estate wise or tooling-wise; tax people and the men from the Internal Revenue are often mis-informed by advance publicity.

**Using current building cost figures as a yardstick,** it can be assumed that the plant will hit a cost of about $15-20 million.

**Tooling will run into the millions.**

**The plant will produce and assemble** steering gear units for cars and trucks—and also make about 6-million small cold-formed parts daily.

## New tooling on auto chassis . . .

**"Unitized Construction"** of the auto chassis is being talked about again. Engineers, who are studying the problem frantically, say that the cost of tooling and other essentials might put the changeover back for two or three years. Not so at another of the Big Three: General Motors reportedly may come out in 1957 with a form of unitized construction in at least two and possibly three of its lines—with further moves made to adapt the rest of the line by 1958.

5403

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IT'S A *Hamilton Tool*

USE IT WITH CONFIDENCE

# Machine Tools . . .

### *Air Force to use current funds for tools . . .*

**For the umpteenth time, the Air Force is ready** to place orders for long lead time machine tools. And this time the wish is surer than on any previous occasion of being translated into actual contracts.

**The Air Force has decided to dip into** its own current operating funds for the $50 million that will be needed.

**It has completely abandoned the idea** of using the reserve money made available by act of Congress.

### *Same machines as for reserves to be bought . . .*

**The original reserve program,** however, will be pretty much carried out, in that the same machines that it called for will be bought.

**They include: skin millers, profile millers,** heavy bed-type and knee-type millers, horizontal boring mills, vertical turret lathes, broaching machines and stretch presses.

**All of these machines are likely to be contracted** for prior to the year-end, unless something extraordinary happens to cause a delay.

**All the processing of the orders has been done.** About the only remaining task is to issue them.

**When the machines are built,** they will be delivered to the plants of Air Force contractors and be put into production. The Air Force is eager to save sizable production costs on planes, made possible by these machines.

**Reserve machine tool money cannot legally be spent** for other than standby equipment.

**Devotion to the principle of immediate usage** instead of storage is one of the main reasons why some of the key Air Force people dragged their feet on the reserve program.

### *October was big month for orders . . .*

**October, which was the month following** the Machine Tool Show at Chicago, was a whopper for machine tool orders.

**More than $103 million of sales** poured into builders' and distributors' offices in that month.

**This total represented a rise almost unprecedented** in peacetime, from $61 million in September, $65 million in August, and $64 million in July. It was the best month's business in over three years.

**The big show obviously was the stimulant.** Many buyers waited to see all the new designs before committing themselves.

**It is too early to tell whether the October upsurge** indicates a long-term trend. Nevertheless very optimistic reports on November sales are coming in from various parts of the country.

**Cincinnati Milling Machine Co** will ship $95 million of products this year, Frederick V Geier, president, said in New York recently. Shipments in the first three quarters of 1955 were well above any previous full peacetime year. In 1954, production totaled $110 million, but much of the volume was defense work. Cincinnati Milling's backlog today is about $69 million and will be higher than that at year's end. Shipments next year, including Heald Machine, and Advance Solvents and Chemical subsidiaries will be more than $110 million.

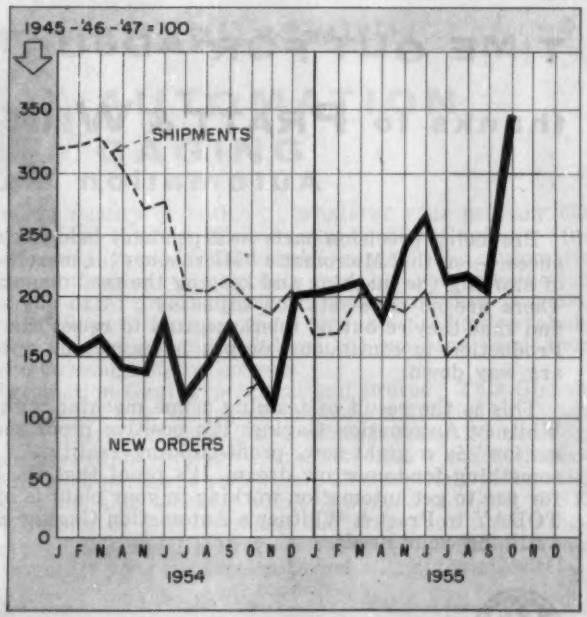
### *Detroit still spearheads machine tool buying . . .*

**Automobile companies still spearhead** machine tool buying. But sales are well distributed throughout small as well as big companies in a variety of metalworking industries.

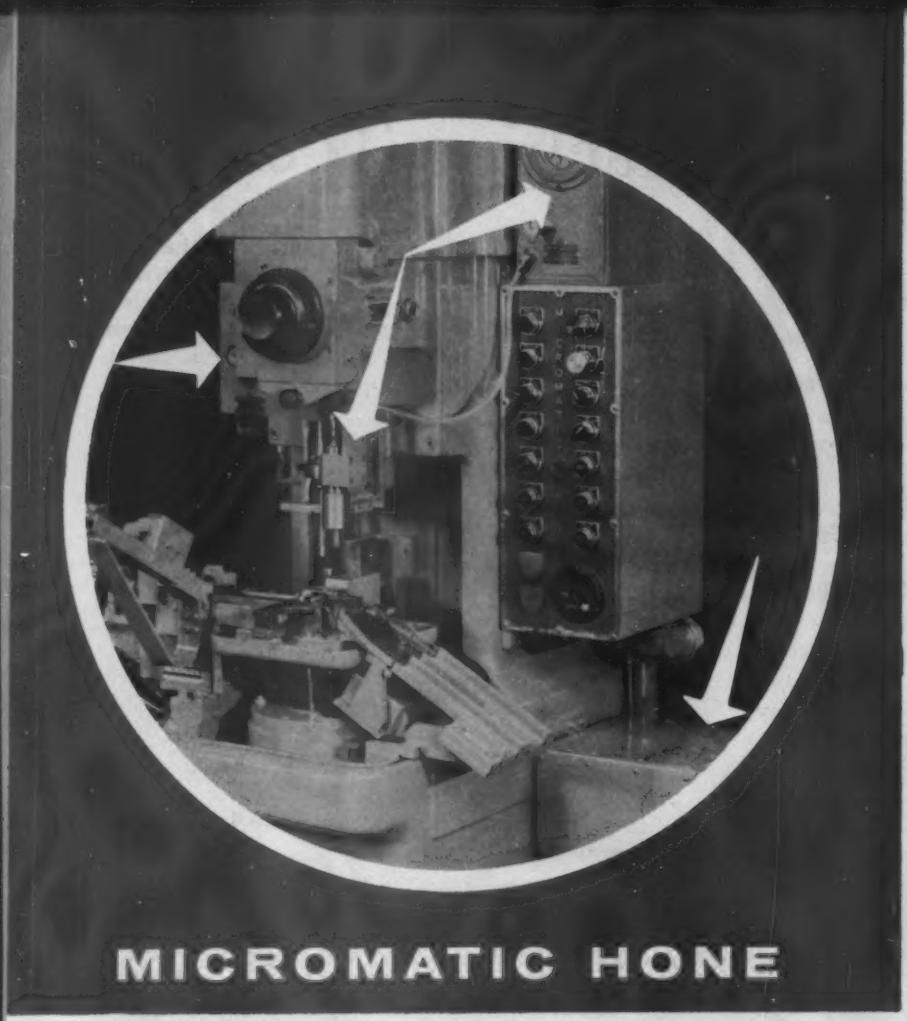
**New orders for metal-cutting machine tools** totaled $682 million in the first 10 months of 1955. That is $122 million more than in all of 1954.

**Machine tool shipments in October** were less than half the dollar volume of new bookings, or only $60 million. Shipments for the year have lagged $145 million behind new orders.

**Press builders are reported to be loaded with work.** One prominent company's backlog is 50% above June 30, with incoming orders pouring in.




**TREMENDOUS JUMP IN NEW ORDERS** for machine tools to a post-Korea high of 349.7 on the National Machine Tool Builders' Association Index reflects the spectacularly successful Machine Tool Show in Chicago in September. Shipments so far show little reflection of the Show because of lead times, although October shipments rose to 204.8




## eliminates TIME OUT FOR ADJUSTING thanks to PRATT & WHITNEY Automation Gaging

Producing precision parts — dependably held to close tolerances — on this Micromatic "Microhoner" is merely a matter of starting the machine and keeping the feed magazine filled. There are no time-outs for adjusting . . . to gage parts, to find that they're out of tolerance, and to re-set the machine. Production is continuous, output is increased, reject losses are way down.

This is the result of teaming a fine machine with Pratt & Whitney Automation Gaging. It's positive proof that "automation" is a right-now, profit-building reality . . . NOT a something-for-tomorrow dream. It's proof that the best way for *you* to get automation working in your plant is by writing TODAY to Pratt & Whitney's Automation Gaging Engineers outlining your needs.

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MACHINE TOOLS GAGES CUTTING TOOLS

# Automation

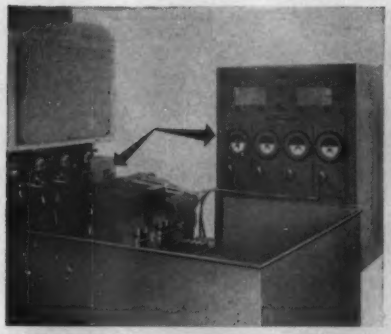
## and what to do about it...

"Automation? Oh, that means transfer machines like those expensive installations at Detroit." But this definition is both inaccurate and dangerous. Inaccurate, because the transfer machine is just *one*, not-too-representative example of automation as it is applied to a specific set of requirements . . . dangerous, because no manufacturer today can afford to remain uninformed about automation and summarily dismiss it as ". . . something for the real big boys but not me."

Very simply, automation is the use of automatic or semi-automatic devices to control the flow in a manufacturing process or to integrate two or more manufacturing operations. It is also a very practical and effective method of increasing production, and improving accuracy or product quality. The too-common idea that effective use of automation demands a very high volume of production is fallacious; some degree of automation can, in fact, be profitably applied by a majority of manufacturers. The sensible course is certainly to gather the facts about automation and its applications and determine carefully which of the currently available means of automation are best suited to your company's present and future needs. Close cooperation between Engineering and Management is essential.

While the science of automation potentially embraces *all* means of controlling and integrating flow throughout the manufacturing process, the most immediate and important demands are for closer integration of the machining and gaging operations. In this field, the Pratt & Whitney Company has been remarkably successful, integrating these two operations by means of P & W Gages and Control Units applied directly to production machines and machine tools. Working in close cooperation with machine tool manufacturers, P & W has engineered automation gaging units that have made it possible to produce new machines capable of completely automatic production. These machines are not only self-operating but are also *self-correcting* — automatically gaging work as it is machined and, by means of a "feedback" impulse from the gaging unit, resetting tools to maintain correct tolerances at all times. An example is the new, P & W - equipped New Britain-Gridley Automatic Dual Boring Machine. Operation . . . loading; handling, machining, gaging and machine correction . . . is completely automatic from start to finish. There are no production halts

*(Advertisement)*



*New Britain-Gridley Automatic. P & W Control Units provide in-process gaging and automatically re-set cutting tools.*

to gage work and make adjustments, output is very high (120 pieces per hour), and work is dependably held to a tolerance of .0003".

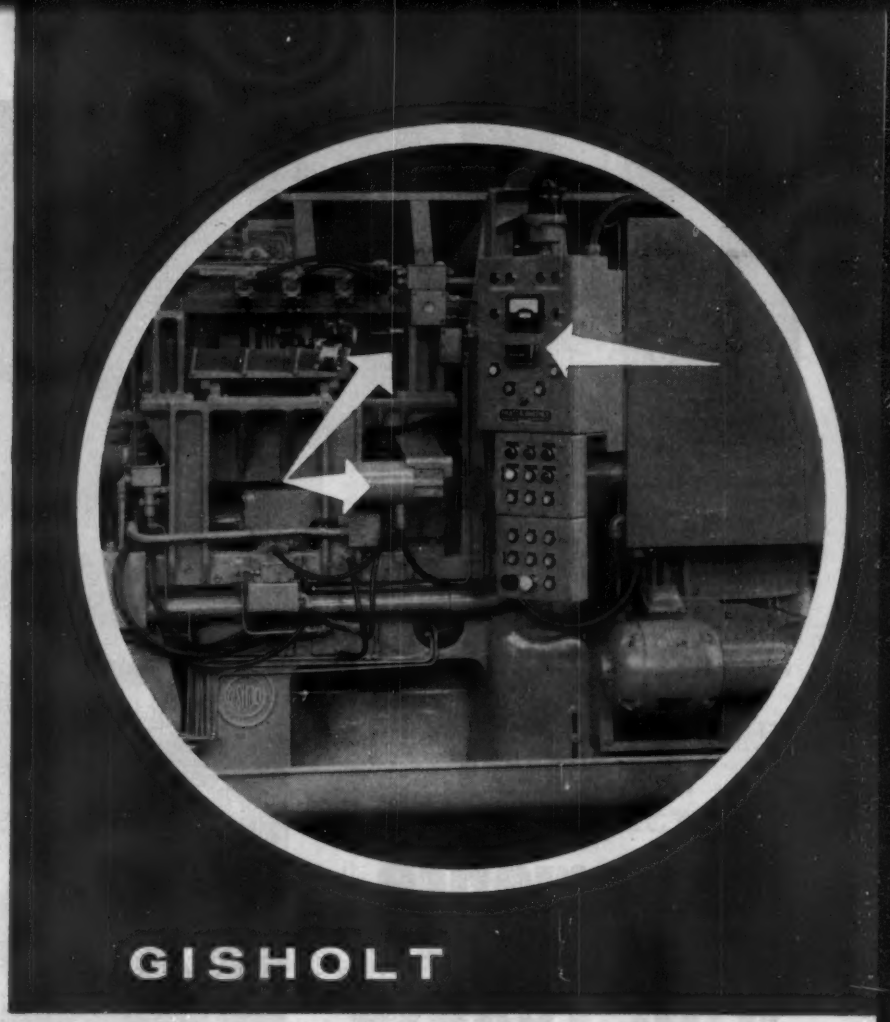
Many modernization programs dictate a *gradual* replacement. While many of the older machines that must be retained do not lend themselves to the application of "feed-back" control, P & W In-Process Gaging has been successfully applied to them and has effected important increases in productive efficiency. For example, a P & W Gaging Unit was recently applied to a centerless grinder to gage outer bearing races automatically as they are fed from the machine. Scrap losses have been reduced 40%; non-productive downtime has been sharply cut since the operator can adjust the machine without stopping production and *before* parts exceed limits; output has been increased without sacrificing accuracy.

No, there's nothing mysterious about automation. It's just a sudden leap ahead in the direction industry has been traveling for some time.

*P & W Gaging Units check precision bearing races continuously and automatically as they are fed from this centerless grinder.*

This sudden acceleration has come about because automation is one of the best available ways to meet post-war demands for increased output, precision and economy. What each individual manufacturer does about automation depends on his own specific requirements. However, one thing *no forward-looking manufacturer* can afford to do about automation is ignore it and do nothing!

*(Advertisement)*




## always "ON TARGET"... automatically with

## AUTOMATION GAGING

Quantity, quality or both . . . whatever your primary objective may be, Pratt & Whitney Automation Gaging — in-process checking plus "feed-back" control for automatic machine adjustment — can help you hit your production targets. Here are: *Greater Accuracy* than ever before possible, *Increased Output*, because there are no production shut-downs to gage parts and re-adjust the machine; and *New Economies* through fewer rejects.

Is Automation Gaging practical and proved? This Gisholt Automatic with P & W Gaging produces a finished precision rotor for fractional horsepower motors *every 10 seconds.* Machine operation with self-correction, size control, inspection of finished parts and sorting are all completely automatic.

Don't wait and wonder about automation. GET THE FACTS. Write to P & W *today* outlining your machining-gaging problems and let Pratt & Whitney Specialists show you how to hit your production target . . . automatically!

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MACHINE TOOLS GAGES CUTTING TOOLS

# 1948-1955 Sikorsky's 7-year experience with Texaco Regal Oil

**THIS 5,000**-ton Bliss press at Sikorsky Aircraft, Bridgeport, Connecticut, went into service seven years ago with an initial fill of *Texaco Regal Oil R&O* as hydraulic fluid. Some four years later a cooling coil in the hydraulic system broke and the entire charge had to be withdrawn. Engineers found the original *Texaco Regal Oil R&O* still in perfect condition and the system completely free from sludge and rust.

It was, however, decided to use this oil for other purposes in the plant and to put the press back into operation with a fresh fill of *Texaco Regal Oil R&O*. Recent inspection, after three more years of service, shows the oil still in "like new" condition today—the system perfectly clean.

*Texaco Regal Oils R&O*—a complete line to meet all hydraulic requirements—are turbine-quality oils, refined from choice stocks and fortified with effective inhibitors of rust and oxidation. In fact, tests prove *Texaco Regal Oils R&O* to be *more than ten times as oxidation resistant* as ordinary turbine-quality oils. Throughout their extra-long service life they provide notable protection against sludge, rust and foam.

Let a Texaco Lubrication Engineer help you increase the performance efficiency of all your hydraulic equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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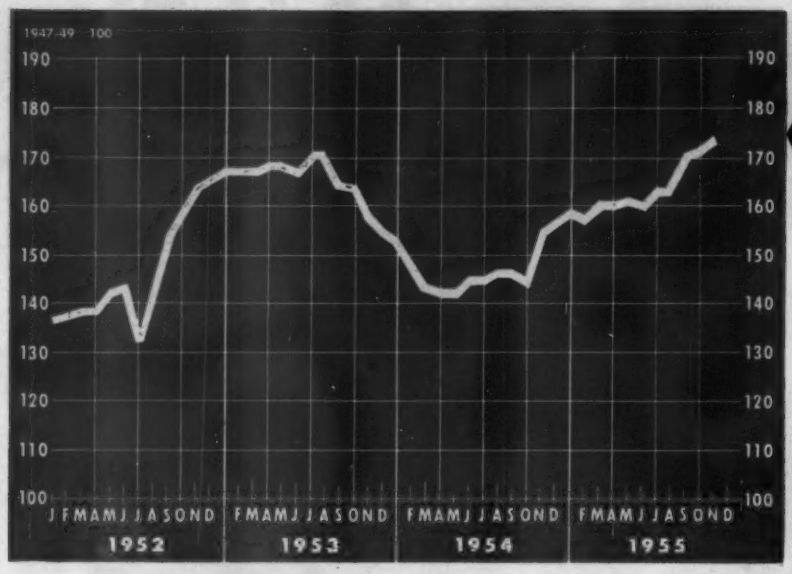
# Gaging Metalworking . . .




## Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

| | NOV. Estimated | OCT. Preliminary | SEPT. Revised | OCT. Year Ago |
|---|---|---|---|---|
| **Total Index** | **174** | **173** | **171** | **149** |
| **Machinery** | **144** | **141** | **124** | |
| **Electrical Machinery** | **204** | **205** | **197** | |
| **Autos** | **123** | **133** | **90** | |
| **Other Transportation** | **360** | **334** | **294** | |
| **Other Metalworking** | **144** | **143** | **126** | |

## AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

### *Good news continues . . .*

**Out-of-this-world automobile production** and a strong demand for capital goods are the main factors supporting Metalworking at an operating level never before reached in peacetime.

**It is doubtful whether there will be** any further rise in output beyond today's stupendous volume.

**At the same time, production is not likely to dip** except slightly, and it may not go down at all for some time.

**Massive outlays for new plant and equipment** give perhaps the best support of all to Metalworking.

### *Capital goods indexes rise . . .*

**Almost all the indexes in the capital goods field** have been climbing for a number of months. In some cases, new records have been established.

**This strength promises well for 1956.** Look at big electric generating equipment and machine tools.

**Both industries will produce much more next year** than this year.

**There are indications that production** in some metalworking lines may be limited principally by the ability to secure materials and by plant facilities.

**Steel shows no signs whatever of weakening.** If anything, demand is greater than ever and many customers are clamoring for more tonnage.

**At least a few small steel users,** indignant because they are getting only a piddling amount from the mills this quarter, have appealed to Washington for help.

**The situation is critical enough** that rumors of foreign steel imports and of conversion deals have cropped up. But this is mostly talk.

### *Tool and die shops are humming . . .*

**Looks like auto tooling orders** are spilling out from overflowing Detroit tool and die shops to other industry centers.

**National Tool & Die Manufacturers Association** reports that shops are working plenty of overtime in big centers like Cleveland, and of course, Detroit. September orders were up 9% over those for August, and a good 30% of September 1954.

**But the significant thing** is that while orders are on the rise, backlogs are staying at a normal 6 to 8 weeks. September shipments, too, were running ahead of August—about 5%.

**While 1955 will be no record breaker** for the tool and die industry, 1956 is expected to easily surpass the all-time record volume of 1953.

**Poll of NTDMA members** shows two-thirds think 1956 business will be in the good-to-excellent class, that 33% expect only fair business, and only 1% think next year will be a tool and die stinkeroo.

### *Landoffice steel business . . .*

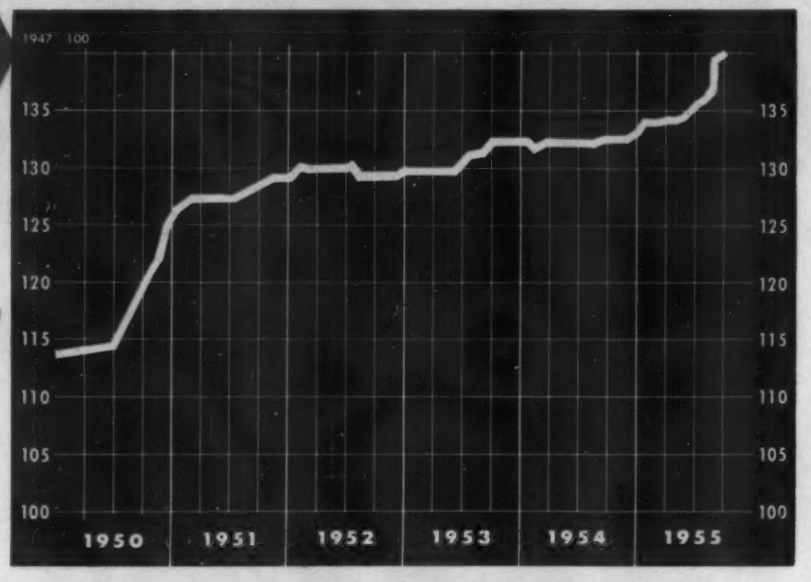
**Cleveland reports that for the first time since 1947** steel companies maintained wire drawing, sheet and strip rolling operations on Thanksgiving Day. That'll give you some idea of the volume of business on steel firms' order books. In fact, first quarter 1956 books are already overloaded on some items like strip and sheet.

**Steelmakers say no customer** has yet had to cut operations because of a shortage of steel. They say the extra-heavy demand is from customers wanting to get on the mills' order books for inventory tonnage because they expect a price rise between now and March.

# Gaging Business . . .

## Price Index

| | NOV. Estimated | OCT. Preliminary | SEPT. Revised | OCT. Year Ago |
|---|---|---|---|---|
| **Total Index** | **140.0** | **139.8** | **139.0** | **132.7** |
| **Metalworking Machinery** | **157.2** | **156.9** | | **143.1** |
| **Other Machinery exc. Electrical** | **146.4** | **145.2** | | **137.6** |
| **Electrical Machinery** | **136.2** | **136.0** | | **130.3** |
| **Fabricated Metal Products** | **134.6** | **132.9** | | **129.0** |




**AMERICAN MACHINIST INDEX OF METALWORKING PRICES**

### *Industrial boom at crest . . .*

**Industrial production is currently riding a boom,** but the boom is not getting any bigger than it has been for some time (and that is big enough).

**Federal Reserve Index was the same in October** as in September, at 142 (1947-1949 = 100). The point is that the October level was 13% above the same month of the preceding year.

**It is a good guess** that November will not show much if any change from October.

### *Durable goods responsible for boom . . .*

**Durable goods output has been responsible for** pushing the index up to its present dizzy height.

**Nondurable goods manufacture,** by contrast, is lower now than it was earlier in the year.

**The work-week in October averaged 41.2 hours.** That is the longest it has been since the end of 1952.

**It is 1½ hours more than in the same month of 1954.** Non-agricultural employment went up to 50.4 million in October, a record for the month. Jobs in industry and in retail trade rose during the month.

### *Housing starts off a bit . . .*

**Housing starts are down a bit.** They amounted to 107,000 units in October, a drop of 6000 from the preceding month. It was the second month in a row in which a decline occurred compared with the same month of last year.

**1955 nevertheless is going to be the second best** year in history (and the best year in dollars) for housing starts. Total for the year: 1.3 million units.

**Farm income in 1956 is not likely to cause** any hat-throwing. Experts in the Department of Agriculture are predicting a further drop from this year. Net income of farmers may be off 10%.

### *Dealers' stocks of cars rising . . .*

**With automobile assemblies up around 180,000 units** a week, the number of cars in dealers' hands at the end of the year promises to top 600,000 units.

**Output of passenger cars in 1955** will be close to 8 million units, a new record.

| WEEKLY BUSINESS INDICATORS | Latest Week | Preceding Week | Year Ago |
|---|---|---|---|
| *Business Week* Index of Activity (1947-1949 = 100)* | 147.8 | 148.1 | 130.7 |
| Steel ingot operation (thousands of tons) | 2,389 | 2,394 | 1,915 |
| Electric power output (million kilowatt hours) | N.A. | 10,878 | 9,317 |
| Production of automobiles and trucks | 211,632 | 215,221 | 160,149 |
| Engineering construction awards (*Eng. News-Record*—millions) | $305.5 | $401.7 | $254.2 |
| **MONTHLY BUSINESS INDICATORS** | **Latest Month** | **Preceding Month** | **Year Ago** |
| Index of industrial production (1947-1949 = 100)* | 142 | 142 | 126 |
| Index of durable manufactures production (1947-1949 = 100)* | 161 | 160 | 139 |
| Durable goods manufacturers' sales, millions* | $13,846 | $13,745 | $10,832 |
| Machinery manufacturers' sales, millions* | $ 3,453 | $ 3,484 | $ 3,081 |
| Durable goods manufacturers' new orders, millions | $14,957 | $15,145 | $11,153 |
| Machinery manufacturers' new orders, millions | $ 3,939 | $ 3,833 | $ 3,073 |

*Seasonally adjusted
N.A. Not available

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# T-J Spacemaker CYLINDERS

CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
40% SPACE SAVED
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- Oil pressure to 750—AIR to 200 P.S.I.
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More and more of industry's automation problems today—solved with T-J Spacemaker Cylinders! New compact design and many more plus features for a new high in efficient cylinder performance and dependability. Wide range of styles, capacities . . . to help you *save labor, reduce costs* on all kinds of push-pull-lift jobs. Send for bulletin SM-155-1. The Tomkins-Johnson Co., Jackson, Mich.

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# Where to get Armco Stainless Bar Stock In a Hurry

If you need quick delivery of stainless steel bar stock or wire, remember this: An Armco Distributor's stock is probably close-by. A phone call is all that is required.

When you want stainless screws, bolts, nuts and accessories, they can come right along with your order for bars and wire.

You'll find that Armco Stainless Distributors know their business. All have mill-trained salesmen who are kept informed by Armco. They have the latest Armco literature—available for the asking—on forging, pickling, machining and the other fabricating operations on stainless steels.

Look over this list of Armco Stainless Steel Bar and Wire Distributors. There's probably one near you, in your own "back yard."

## ARMCO STAINLESS STEEL BAR AND WIRE DISTRIBUTORS

**ARIZONA**
Phoenix
Ducommun Metals & Supply Co.

**CALIFORNIA**
Emeryville
Electric Steel Foundry Co.
Los Angeles & National City
Ducommun Metals & Supply Co.

**COLORADO**
Denver
Metal Goods Corporation

**CONNECTICUT**
Hartford
The Am. Steel & Aluminum Corp.
Peter A. Frasse & Co., Inc.

**GEORGIA**
Atlanta
J. M. Tull Metal & Supply Co.

**ILLINOIS**
Chicago
Central Steel & Wire Co.
Chicago Steel Service Co.

**KANSAS**
Wichita
Metal Goods Corporation

**LOUISIANA**
New Orleans
Metal Goods Corporation

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Auburn
Brown-Wales Company

**MARYLAND**
Baltimore
Seaboard Steel & Iron Corp.

**MASSACHUSETTS**
Cambridge
Brown-Wales Company
Industrial Steels, Inc.
Fall River
Congdon & Carpenter Co.

**MICHIGAN**
Detroit
Central Steel & Wire Co.

**MISSOURI**
North Kansas City
Metal Goods Corporation
St. Louis
Metal Goods Corporation

**NEW YORK**
Buffalo
Peter A. Frasse & Co., Inc.
Rochester
Follansbee Metals Corporation
Syracuse
Peter A. Frasse & Co., Inc.

**METROPOLITAN NEW YORK**
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Peter A. Frasse & Co., Inc.
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Edgcomb Steel & Al. Corp.
Lyndhurst, N. J.
Peter A. Frasse & Co., Inc.
Union, N. J.
Mapes & Sprowl Steel Co.

**NORTH CAROLINA**
Charlotte
Edgcomb Steel Company

**OHIO**
Cincinnati
Central Steel & Wire Co.
Cleveland
Cleveland Tool & Supply Co.
Viking Steel Company
Columbus
Varys Brothers, Inc.

**OKLAHOMA**
Tulsa
Metal Goods Corporation

**OREGON**
Portland
Electric Steel Foundry Co.

**PENNSYLVANIA**
Philadelphia
Edgcomb Steel Company
Peter A. Frasse & Co., Inc.
Pittsburgh
Follansbee Metals Corporation
York
Edgcomb Steel Company

**RHODE ISLAND**
Providence
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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

# Nothing Like a Good Figure

More than 100,000 metalworking people took time to visit Chicago in September and see the new machine tools designed to meet the shop requirements of this automated era.

For every potential user who saw the machines, however, there were at least five who did not.

**Aside from their marvelous mechanical perfection these cost-saving machines mean little or nothing to any user until they are related to his own manufacturing situation.**

More than that, they mean little to him except as a pious hope until they are applied to individual operations in his shop. Not until that point is reached does he begin to think of them in terms of specific savings and profits.

Perhaps the user is the kind of person to whom the exactitudes of a MAPI formula, or a modification of it, hold a genuine appeal. If so, such a formula should be put to good use immediately.

But if he is a shop man who regards formulas as pretty fancy stuff and he pretends to, or actually doesn't, understand them, then a down-to-earth approach obviously is preferable.

**In any event, the virtues of these new machines and their vast superiority over previous models, no matter how loudly they are trumpeted, will not move any user to install them in his shop until a conclusive arithmetical calculation, even if only on the back of an envelope, proves to him that he cannot afford to keep his old machines.**

This is where the machine tool builder's sales engineer comes in. Sales engineer is not just a high-sounding title for an ordinary salesman. It means what it says.

For the fact is that the back-slapping, buy-you-a-drink kind of selling is as obsolete as much of the machinery in metalworking shops. Today's sales engineer knows machine tools. More especially, he is intimately schooled in the fine points of the particular machines he is selling.

He makes it a practice to go out into the user's plant and study his production problems in terms of specific jobs to be done. To break the cost bottleneck is his specialty.

Much of the hope of putting the newly-designed machine tools to use rests upon the ability of a relatively small corps of sales engineers to show users of production equipment exactly why and how they should modernize.

**At least one billion dollars a year is being wasted in inefficient machining costs because metalworking companies retain old machines longer than they should. The immediate task of machine tool sales engineers is to translate those general terms into specific figures with individual users.**

Nothing will make a user spend his money faster for new equipment than proof that it will pay off in an incredibly short time.

Burnham Finney

EDITOR

# "CINCINNATI"

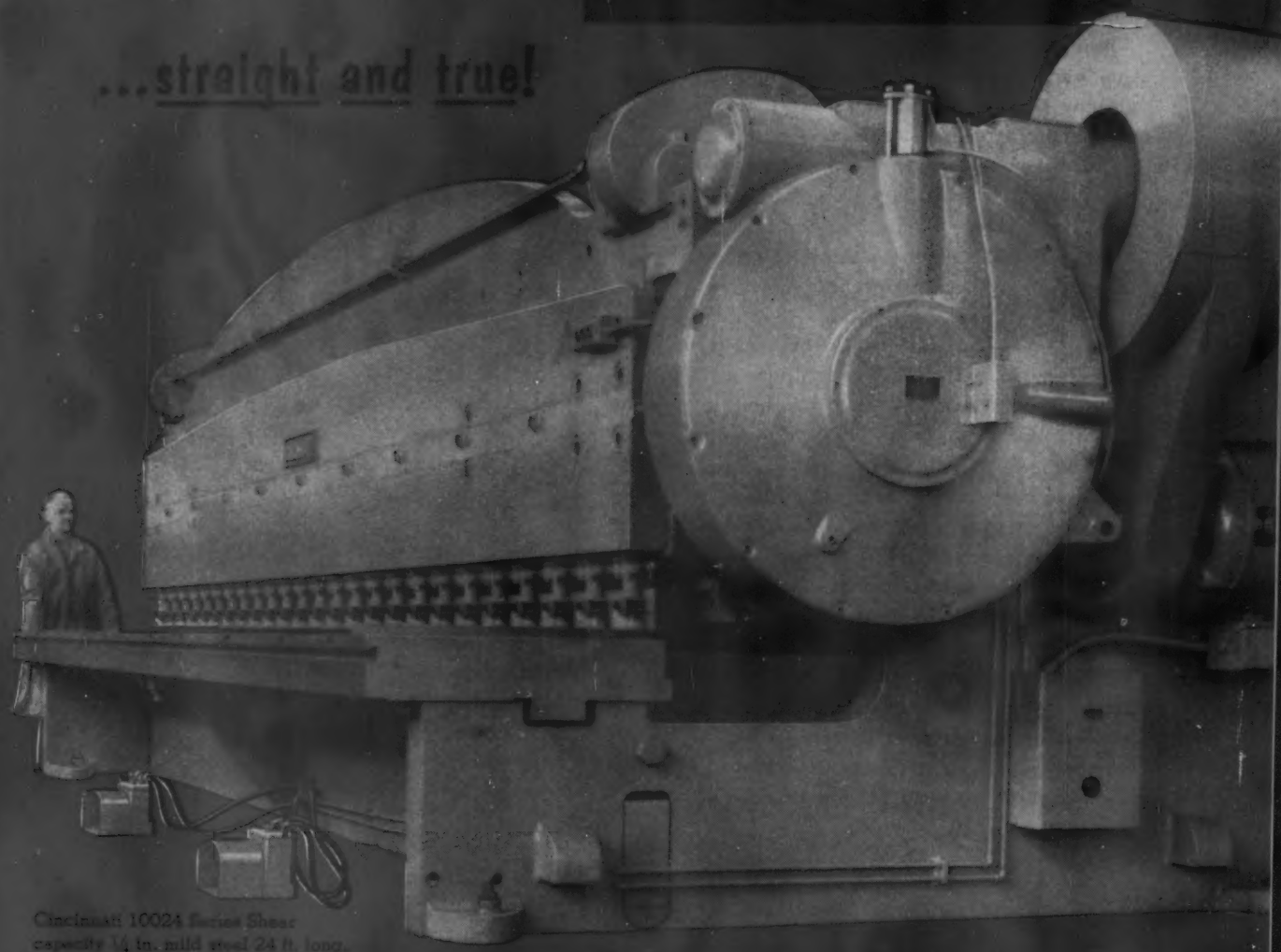
## ...shears 24 feet of ¼ inch plate

## ...straight and true!

Cincinnati Shears, built with machine tool accuracy and exceptional rigidity, cut to close tolerances even on the longest cuts.

Built in lengths from 4 ft. to 24 ft., they shear .005" thick sheets to 1¼ in. plate with micrometer accuracy. They handle a wide variety of materials ranging from soft aluminum to armor plate.

Write for complete shear catalog S-7.



Cincinnati 10024 Series Shear capacity ¼ in. mild steel 24 ft. long.

CINCINNATI

**THE CINCINNATI SHAPER CO.**

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

American Machinist

# *Got a new-product idea?*

## WEIGH IT BEFORE YOU WEEP!

**Before committing any company to the manufacture of a new product, sound management requires some prediction of manufacturing cost, necessary dollar investment, building space required, and many other factors. How elaborate should these predictions be? This decision rests with the individual management, the particular situation for the product being considered, and the time and trained personnel available for the task. Management should have as complete a picture as it is possible to produce, as a foundation for decision. Here is one procedure that works**

RENO R COLE, manager,
Methods & Standards Department
FRIDEN CALCULATING MACHINE CO.
SAN LEANDRO, CALIF

During recent years we have had the opportunity to make predictions, or estimates, for a number of different products which were proposed for production. We also have followed four of these products through the various planning stages into actual manufacture in the plant.

Defense products included a machine gun, a proximity fuse, an aircraft driftmeter, and two classified devices. Two of these products are now in production.

Commercial products included an adding machine, punched tape, and a compu-typer, plus preliminary planning for production of calculators in Holland and in South America. The products were all prime contracts or complete units and are complicated electro-mechanical devices having thousands of parts and subassemblies.

As a result of the work done on the products mentioned, considerable experience has been gained in making such estimates. No small amount of thought and effort has gone into finding an efficient and accurate method of accomplishing the often formidable task of furnishing the information required. An idea of the size of the task can be obtained from Table I, much or all of which may be required.

It is of vital importance that the information furnished be reasonably accurate. Unfortunately, it is also often necessary to produce the information in a

## *Got a new-product idea?*

*Continued*

limited time. Thus is imposed the need for a system of estimating which will give the complete information and which is rapid, simple, and accurate.

Before describing the method which we have worked out, it might be well to describe the ideal array of information which should be available to the estimators:

1 . . A complete set of drawings, including drawings of sub-assemblies and major assemblies. Drawings should be reproducible or, if not, several sets should be furnished.

2 . . A parts list arranged in order of assembly.

3 . . A parts list arranged in numerical order.

4 . . A bill of materials

5 . Copies of all applicable specifications.

6 . . An actual finished unit or prototype, or if these are not available, photographs.

7 . . A purchase description or description of the unit and its functions.

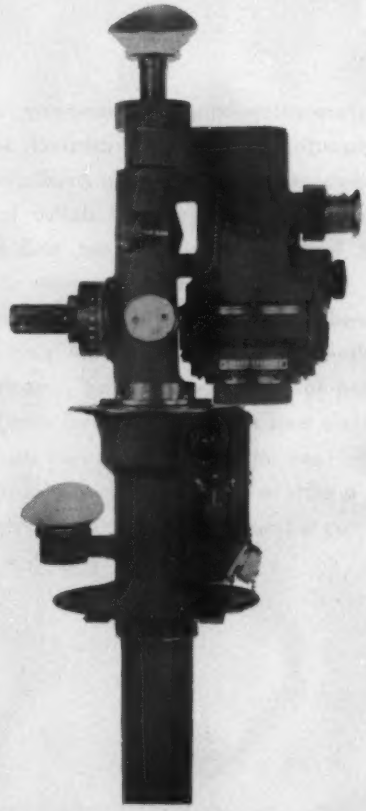
8 . . The required rate of production, the number of shifts to be worked, and the total quantity of units to be produced.

Complete information, as listed above, contributes greatly to the accuracy of the estimate and to the speed with which it can be accomplished. Any of the information mentioned which is missing must be supplied by deduction or from the imagination of the estimators, a time-consuming and uncertain process.

It is important for the estimator to study the drawings first, then carefully read any purchase description and specifications available, and to study any prototype model, photographs, etc which are available. The estimator should form at this time as complete an impression as possible of the operation of the finished unit and the function of its various parts. This understanding will enable the estimator to make intelligent decisions where the information furnished is not clear or is incomplete. Even with the best drawings and specifications, there are many things which have to be decided regarding such details as finishes, heat treatments, and tolerances. The accuracy with which these decisions are made may have an appreciable effect on cost and requirement factors. A general idea of factors such as the size of the project, type of tolerances, proportion of purchased parts, and the main types of machine tools and equipment required may also be gained. These all help in setting up the estimating job.

As a considerable length of time is required to get quotations from the vendors of castings, moldings, and other purchased parts, lists of these items are

**NEW CALCULATOR DESIGN . . .**
permits simultaneous punching of tape; required fairly complex planning. Only after manufacturing calculations are complete can sales department predict the market. Then Engineering, Manufacturing, and Sales merge their opinions to give top management the information necessary to decide whether the product will be made



**DRIFTMETER . . .**
is typical of more complicated military products. By applying thorough, detailed statistical analysis to products in this category at the design stage, bidding can be more accurate and when a contract is received the job is much closer to the production stage. New-product "bugs" are minimized

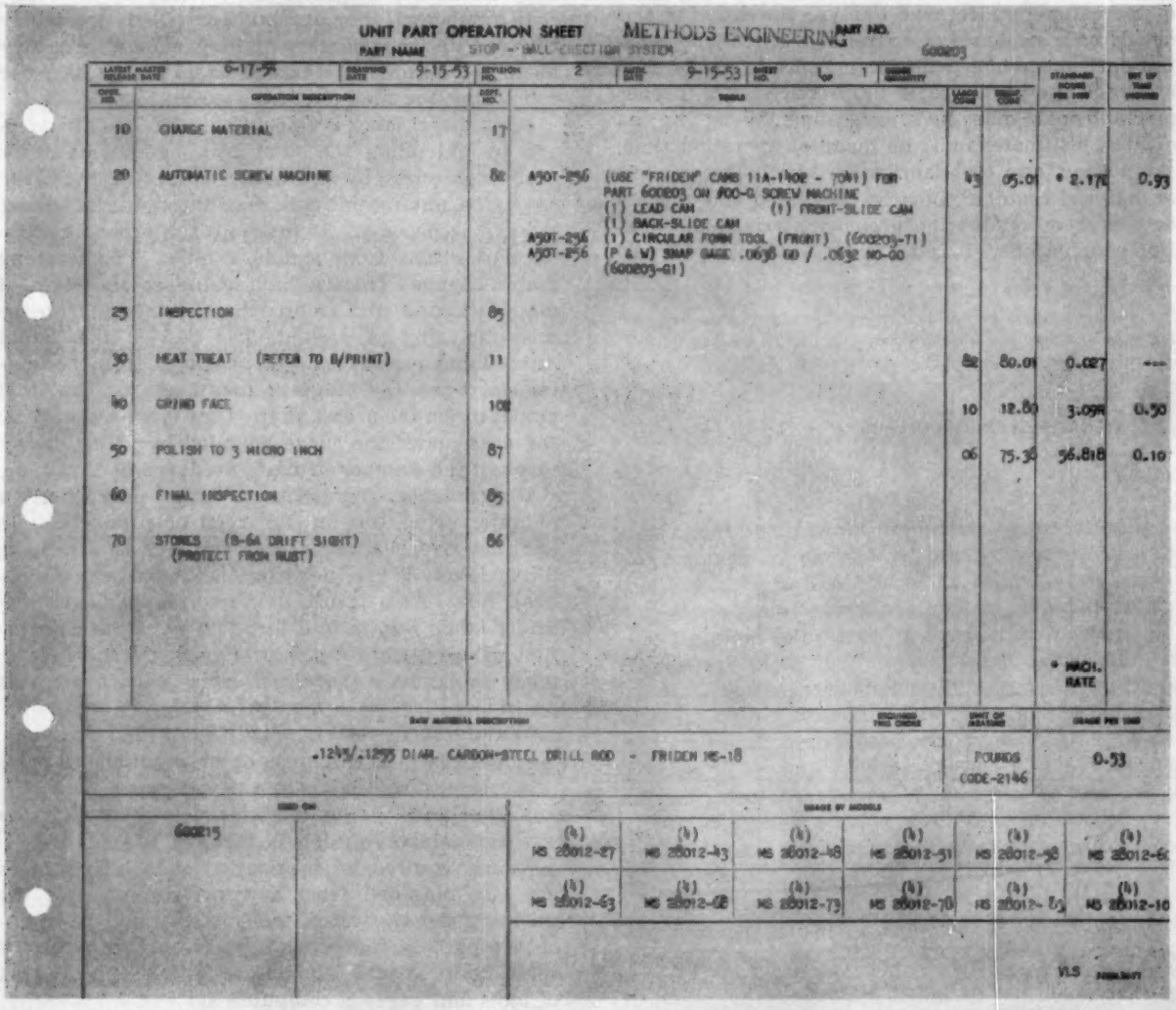
prepared at this time and referred to the purchasing department.

The key to our system of estimating is the *planning sheet*. This form is practically identical to our manufacturing operation sheet and shows the name of part, sequence of operations, department, tools and gages required, estimated tool and gage fabrication hours, estimated direct labor at standard, estimated set-up time, machine-tool equipment, labor wage class, kind and amount of material required, and the quantity of the particular part required in the final unit. Planning sheets for assemblies also give, in addition, a list of parts and subassemblies with the quantity of each required in the assembly.

When a complete set of planning sheets has been prepared for the project it is possible to summarize from them much of the necessary information. The method of making these summaries will be described later.

It is essential that there be a meeting of minds, from the beginning of the project, between the various production departments as to how the parts and assemblies are to be fabricated. Unless this agreement exists it is possible that the method of fabrication selected by the estimators, and on which estimated cost and factory requirements have been based, will not be followed closely enough by the departments responsible for tool design and finalization of production methods. This, of course, can result in large errors in the estimate.

To avoid this situation, the planning sheets are reviewed as they become available by a committee comprising representatives from Tool Engineering, Production Engineering, Methods Engineering, and



UNIT PART OPERATION SHEET — METHODS ENGINEERING

PART NAME STOP — SMALL SECTION SYSTEM — PART NO. 600203

| LATEST MASTER RELEASE DATE | DRAWING DATE | REVISION NO. | DATE | SHEET NO. | SHEET QUANTITY |
|---|---|---|---|---|---|
| 6-17-54 | 9-15-53 | 2 | 9-15-53 | 1 of 1 | 1 |

| OPER. NO. | OPERATION DESCRIPTION | DEPT. NO. | TOOLS | LABOR CODE | MACH. CODE | STANDARD HOURS PER 1000 | SET UP TIME (HOURS) |
|---|---|---|---|---|---|---|---|
| 10 | CHARGE MATERIAL | 17 | | | | | |
| 20 | AUTOMATIC SCREW MACHINE | 82 | A50T-256 (USE "FRIDEN" CAMS 11A-1402 - 7041) FOR PART 600203 ON #00-G SCREW MACHINE (1) LEAD CAM (1) FRONT-SLIDE CAM (1) BACK-SLIDE CAM<br>A50T-256 (1) CIRCULAR FORM TOOL (FRONT) (600203-T1)<br>A50T-256 (P & W) SNAP GAGE .0630 GO / .0632 NO-GO (600203-G1) | 43 | 05.01 | * 2.170 | 0.93 |
| 25 | INSPECTION | 85 | | | | | |
| 30 | HEAT TREAT (REFER TO B/PRINT) | 11 | | 82 | 80.01 | 0.027 | --- |
| 40 | GRIND FACE | 102 | | 10 | 12.80 | 3.098 | 0.50 |
| 50 | POLISH TO 3 MICRO INCH | 87 | | 06 | 75.30 | 56.818 | 0.10 |
| 60 | FINAL INSPECTION | 85 | | | | | |
| 70 | STORES (B-6A DRIFT SIGHT) (PROTECT FROM RUST) | 86 | | | | | |
| | | | | | | * MACH. RATE | |

| RAW MATERIAL DESCRIPTION | REQUIRED THIS ORDER | UNIT OF MEASURE | USAGE PER 1000 |
|---|---|---|---|
| .1293/.1295 DIAM. CARBON-STEEL DRILL ROD - FRIDEN HS-18 | | POUNDS CODE-2146 | 0.53 |

| USED ON | USAGE BY MODELS | | | | | |
|---|---|---|---|---|---|---|
| 600215 | (4) HS 28012-27 | (4) HS 28012-43 | (4) HS 28012-48 | (4) HS 28012-51 | (4) HS 28012-58 | (4) HS 28012-6 |
| | (4) HS 28012-63 | (4) HS 28012-68 | (4) HS 28012-73 | (4) HS 28012-78 | (4) HS 28012-83 | (4) HS 28012-10 |

VLS

**IN THE PREDICTION STAGE . . .**

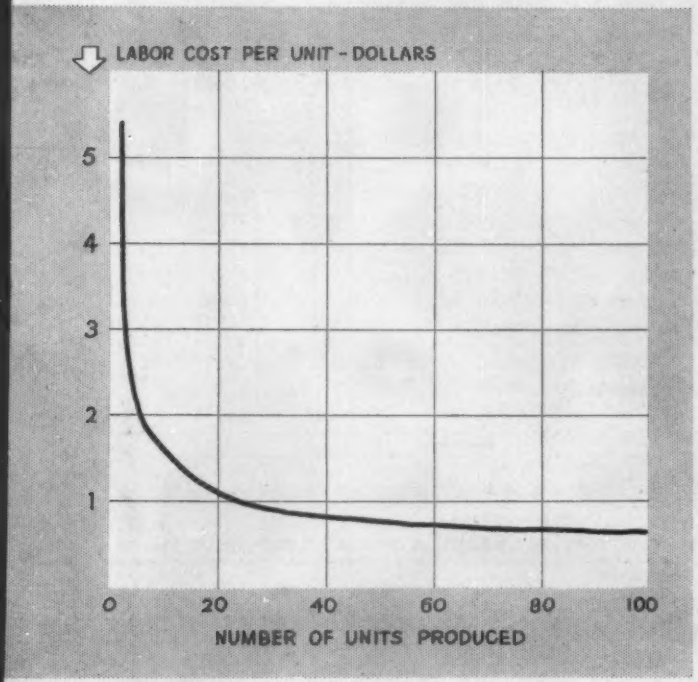
an operation sheet is prepared for each part and for the assembly operations. In the long run this is simpler than rough estimating and much more accurate as all of the individual costs for time and material are included. By summing these figures and applying the factors the total cost is achieved, as well as machine, personnel, and floor space needs

the metallurgical department. This committee reviews only parts for which some difference of opinion exists. It usually is unnecessary to review such parts as are made on punch presses, automatic screw-machines, or by other standarized methods. The committee review procedure provides the further advantage of bringing to bear, early in the project, the best production brains and experience available in the organization.

In writing the planning sheets it is our practice to start with the last detail on the assembly breakdown list and work backwards—through parts, subassemblies, and major assemblies, to the final unit. Thus the estimator is familiar with all the parts and sub-assemblies of a given assembly when he undertakes to write the planning sheet for it.

The actual writing of the planning sheets requires considerable knowledge and experience on the part of the estimator. He must analyze the drawing and decide on a sequence of operations which will make the part and which will be appropriate to the rate at which the parts are to be produced. The proper machine tools must be selected and the tooling indicated. Estimates must be made of operation time, setup time, and tool-fabrication time. The amount of material required must be calculated and entered on the sheet against the proper material-identification code number. It is our practice to make all calculations on the back of the rough-draft planning sheets so all data are available for future reference and for use in making the required estimates when the finalized operation sheets are prepared by Production Engineering.

Summarizing of the required information from the planning sheets is begun as soon as the first sheets are complete and is carried on in parallel with the preparation of the sheets. Thus, summaries are available shortly after completion of the last planning sheets.




**LEARNING CURVE . . .**
**is an important part of the calculation of new-product cost. It plots the labor cost per unit against the number of units built; gives minimum practical quantity and other information**

#### DIRECT-LABOR COSTS

Direct labor, in standard hours, is summarized against the individual wage-class code numbers. (These code numbers represent the dollars per hour of each class of labor used.) Direct material is similarly summarized against the identifying material-code numbers. If the purchased-parts lists previously referred to the purchasing department are now available, all of the required factors are on hand for computing the manufacturing cost.

First, direct labor is calculated to dollars at standard by extending the total hours at standard for each wage class by the dollar values of the wage rates. To obtain the actual dollar value of direct labor it is necessary to estimate the probable variance of actual from standard labor. The learning factor changes from a high value at the start of manufacturing and approaches a steady value as manufacturing progresses. The cost of the actual direct labor per unit can be predicted from a learning curve at any stage of manufacture. The total actual direct labor cost at any time is represented by the area under the curve bounded by a line drawn through the number of units produced at that time.

Direct labor represents a large proportion of manufacturing cost in our type of production. In addition, overhead costs are computed as a ratio to direct labor. We do not establish department overhead rates. As a result, *any error in calculation of direct labor results in a large error in the calculation of manufacturing cost.* Hence, every effort is made to estimate the direct labor as accurately as possible.

Manufacturing cost is calculated in the usual way:

Mfg cost = raw material cost + purchased parts cost + direct labor cost + overhead

Overhead = $f_1$ × direct labor; where $f_1$ is the direct-labor burden factor

Hours required for fabrication of tools and gages are also obtained from a direct summary of the planning sheets. Cost of tool material and tool purchased parts is computed from the known ratios of these items to tool fabrication hours. Then the cost of tools and gages is computed as:

Cost of tools and gages = fabrication hr × wage rate + fabrication hr × wage rate × $f_2$ + fabrication hr × $f_3$ + fabrication hr × $f_4$

Where:

$f_2$ – tool fabrication burden factor

METHODS ENG. DEPT.
DATE 9-30-55

PAGE 1 OF 1 PAGES

MACHINE TOOL LOAD ANALYSIS

1. CONTRACTED ARTICLE DRIETMETER
2. CONTRACT NUMBER 62 (400) - 6392
3. TYPE AND SIZE OF MACHINE MONO-MATIC TRACER LATHE
4. PROPOSED USE PRODUCTION TURNING
5. PRODUCTION RATE PER MONTH 500
6. REJECT ALLOWANCE 3%
7. SPARE PART ALLOWANCE 6%
8. LEARNING ALLOWANCE NONE

| 9 PART NUMBER | 10 PART NAME | 11 OPERATION | 12 LOT SIZE, PIECES | 13 LOTS PER MONTH | 14 SET UP, STD HRS PER LOT | 15 SET UP, STD HRS PER MONTH | 16 PIECES PER UNIT | 17 PIECES PER MONTH | 18 STD HRS PER THOUSAND PIECES | 19 HRS PER MONTH | 20 TOTAL LOAD, STD HRS PER MONTH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 60075 | TUBE, ROTATING | FINISH TURN OD | 400 | 1.25 | .77 | .96 | 1 | 545 | 201.63 | 109.88 | 110.84 |
| 60941 | BRACKET, MAIN | ROUGH & FINISH OD | 900 | .56 | .77 | .43 | 1 | 545 | 239.48 | 130.52 | 130.95 |
| 60506 | HOUSING 1x EYEPIECE | FINISH BORE | 1800 | .28 | .77 | .22 | 1 | 545 | 23.44 | 12.77 | 12.99 |
| 600506 | HOUSING 1x EYEPIECE | FINISH BORE | 1800 | .28 | .77 | .22 | 1 | 545 | 20.50 | 11.17 | 11.39 |
| 600103 | TRACK, BALL | TURN, FACE, BORE | 550 | .91 | .77 | .70 | 1 | 545 | 137.53 | 74.95 | 75.65 |
| 600103 | TRACK, BALL | FACE, C' BORE | 550 | .91 | .77 | .70 | 1 | 545 | 137.53 | 74.95 | 75.65 |

21. TOTAL STANDARD HOURS PER MONTH 417.47
22. TOTAL MACHINE LOAD, ACTUAL HOURS PER MONTH (PERFORMANCE, 65% OF EST. STD.) 642.26
23. REQUESTED NUMBER OF MACHINES 3
24. REQUESTED MACHINE CAPACITY ACTUAL HOURS PER MONTH AT 1 SHIFT 8 HOURS PER SHIFT 504
25. PRESENT NUMBER OF MACHINES AVAILABLE 1
26. PRESENT MACHINE CAPACITY ACTUAL HOURS PER MONTH AT 1 SHIFT 8 HOURS PER SHIFT 168
27. PROPOSED TOTAL CAPACITY AVAILABLE ACTUAL HOURS PER MONTH 672.00

**MACHINE-TOOL LOAD ANALYSIS . . .**
tells you how the new-product manufacturing requirements will mesh with your present operations, what open time is needed, and what additional equipment might be needed to produce the part. In a broader sense, it gives the planner a chance to substitute methods and plan ahead as well as to apply process evaluation to each part at an early stage of the planning. Omitted operations are more readily seen

$f_3$ – known ratio of tool material cost to tool fabrication hr

$f_4$ – known ratio of tool purchased-part cost to tool fabrication hr

One very important summary prepared from the planning sheets is the machine-load chart. When the information has been summarized to these sheets it is possible to tell how the new product will affect the load on present machine tools and what new equipment will be required. Cost of new and additional equipment then can be obtained from vendors.

Special test equipment, packing equipment, and similar items are also summarized from the planning sheets.

The number of production workers which will be required can be calculated from the direct labor figure, number of shifts to be worked, and production rate:

> Number of production workers required per shift = actual direct labor per unit × number of units to be produced per day ÷ (8 × number of shifts to be worked.)

When the number of production workers has been determined, the number of other classes of personnel indicated in Table I can be calculated from our known ratios of personnel such as supervisors, inspectors, and setup men, to production workers.

The exception to this calculation is the number of engineering personnel required, which must be estimated in a different way. The number of tool-design hours needed and the number of tool designers to be employed can be calculated from our known ratio of tool-fabrication hours to tool-design hours. Estimate other classes of engineering personnel from a knowledge of the amount of each type of engineering to be done.

Factory space for the job can be calculated from the number of different classes of personnel to be employed and from the space required by machine-tool and other facilities.

For large projects the final information is typed on 8½ x 11-in. vellum sheets so Ozalid prints can be made. A special page is assigned to each item and an index is provided. Each item of information is cross-referenced to indicate its source in other in-

## *Items to be evaluated*

**DIRECT COSTS**

- Labor, hours, at standard
- Labor, dollars at standard
- Labor, dollars at estimated actual
- Material
- Purchased parts
- Subcontracted items

**INDIRECT COSTS**

- Packing labor
- Inspection labor
- Packing material
- Lighting, heating, air conditioning, water, gas, power
- Installation
- Freight

**ENGINEERING EXPENSE**

- Design
- Tooling
- Production
- Methods
- Miscellaneous — metallurgical, electronic, etc

**CAPITAL INVESTMENT**

- Tools and gages
  - Fabrication hours
  - Material cost
  - Purchased-parts cost
- Machine tools and equipment (including heat-treating equipment, plating, finishing, cleaning and painting equipment.)
  - Cost
  - Installation
  - Freight
  - Taxes, etc.
- Buildings and acreage, amount and cost
- Laboratory equipment, items required and cost
  - Electronic
  - Metallurgical
- Special test equipment, items required and cost
  - Environmental, vibration, electric test, etc
- Packing equipment, items required and cost
- Racks, benches, toteboxes, trucks, conveyors, etc.—number of each required and cost

**PERSONNEL** — quantity of each class required

- Production workers
- Supervisors
- Inspectors
- Engineers and specialists
- Clerks
- Janitors
- Cafeteria attendants
- Guards
- Nurse

**FACTORY SPACE REQUIRED**

- Parts fabrication
- Assembly operations
- Packing
- Offices, etc

**IN MAKING A PREDICTION . . .** these elements must be included to provide accurate cost and factory requirements for new products. To save time, this list can be duplicated with appropriate columns for the necessary figures. Even if it is decided not to produce the product, a file of this tabulated information reduces estimating time on the next proposal

formation in the report or in information on file in the estimating office. It is important that a page in the report be devoted to covering the basis on which the estimate was made so that no misunderstanding can arise as to the assumptions made or the data used. This might include a statement of the number of shifts to be worked, number of hours per week, production rate, and wage rates. The final report is assembled in book form and bound in report covers.

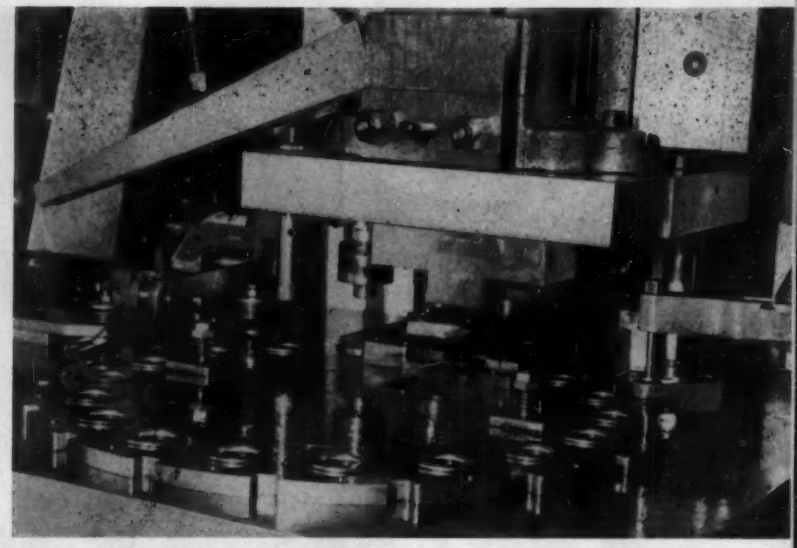
In addition to the final report, which is submitted to Management, the planning sheets are typed in reproducible form so that several sets can be run off. Sets of these sheets are sent to other departments—as a guide to the tools required, to assist in preparation of the finalized operation sheets, and for general information.

While this procedure may seem somewhat laborious, attempt to shortcut it have always resulted in a need for the information at a later date anyway and usually at a greater expenditure of effort than would have been required if the proper job had been done in the first place.

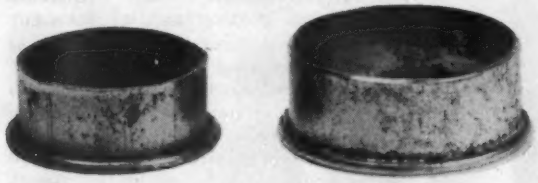
Note, that, in addition to the information made available to Management, a great deal has been accomplished toward sending a project on its way when the procedure as outlined has been completed. The best available experience has studied the job and a meeting of minds regarding fabrication procedures has been achieved. A number of departments have become familiar with the project through their assistance in the estimating work and a set of tentative operation sheets have been made available.

The new project is at the starting gate; needs only a signal from Management to get underway.

Coil stock (1010 dead-soft steel) is fed through the rear of the 50-ton V & O press. The strip passes into a 5-station progressive die mounted within the press dial



Cups made by the progressive die are transferred to the dial and a further operation is performed. Scrap is chopped and falls through an opening in the table. The press makes from 60 to 70 housings for ball bearings per min., and will become part of an automatic line



Outer housings for 1⅛- and 1⅜-in. ball bearings are made by blanking, drawing, piercing and flanging

# Dial press produces 3 times as fast

JAMES J TOOMEY, president, OMEGA BALL BEARING CO

In an industry where the only competitive advantage is in production techniques, we have turned to automatic machinery to triple output and reduce costs.

Although Omega is ten years old, the present management decided on a complete reorganization and machinery-replacement program 20 months ago. Through the use of modern machinery and production techniques we believe that our working force of 40 has the highest productivity rate of any group its size in the industry.

Typical of our new equipment is a specially tooled 50-ton Model 50S press produced and engineered for us by the V & O Press Co, Division of Emhart Mfg Co.

This press, using an 18-station dial feed and a five-station Hamden steel progressive die, turns out 60 to 70 complete outer housings for ball bearings as compared with 20 housings by conventional methods. At present, we have tooled up for 1⅛ in. and 1⅜ in. OD bearings, the two most popular sizes. We estimate that the press and tooling will pay for themselves in 3 yr on the planned production rate.

We feed coil of 1010 dead-soft commercial steel (0.032 in. for the smaller size and 0.038 in. for the larger) into the V & O press. The material is then automatically blanked, drawn, pierced, flanged and ejected.

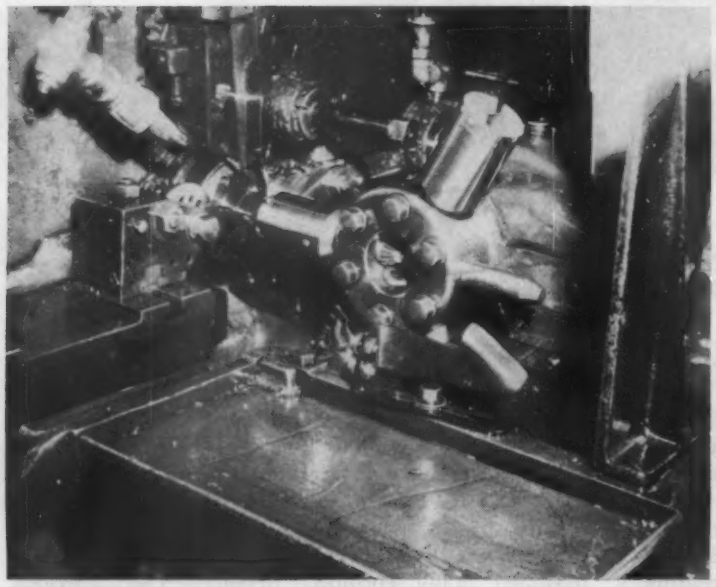
Since the press went into operation, we have obtained many corollary benefits. Our previous method resulted in considerable tool breakage and some rejects. Now, we have no breakage problem and no possibility of rejects. Also, we have eliminated burring and have generally increased product quality. The machine serves as an inspection device because it will not operate with material of nonuniform quality.

One of our engineers is responsible for designing, retooling and trouble shooting. Because we built about 95% of our own dies, and maintain a tool inventory of about $70,000, we consider tool breakage a major problem in production costs.

We are now developing a machine that will take the outer housings produced by the V & O and assemble an entire bearing at the same rate. When this machine is in production, we plan to use the two units as a single production line.

## talented tooling

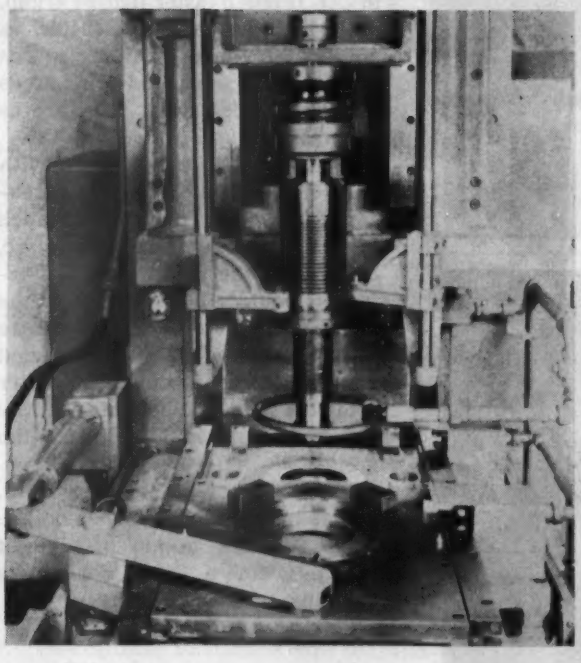
***at Bethlehem Pacific's San Francisco shipyard:*** **TILTED ROTARY TABLE AT DRAW-CUT SHAPER** indexes automatically so top surface of bronze casting is machined at 1° 10′ to horizontal. Work is a hollow chamber for Stanford University's new 220-ft linear accelerator for atomic research. Chamber weighs 1023 lb, has 88-in. OD, and wall thickness of only 7/16 in.; this made casting difficult because the bronze had to be vacuum-tight. Length of cut is 16 in.



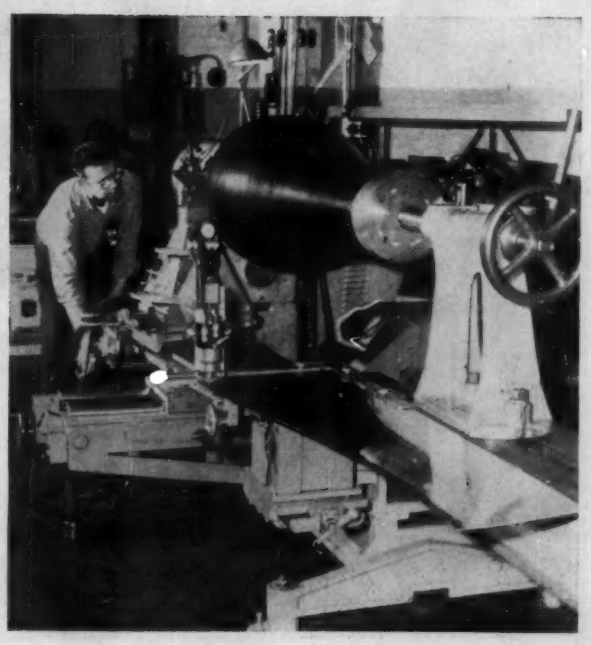
***at Friden Calculating Mach Co, San Leandro, Calif:*** **TWO DRIVEN ECCENTRIC CUTTER HEADS ON SCREW MACHINE** eliminate second operation on small pivot screws for calculators. Both heads (drum-like rigs on turret) are driven through bevel gears, right-angle drive, and independent motor on back of machine. Two cutters work in roughing head to balance; one blade does finishing in the other head. Other regular operations are turning, shouldering, chamfering, threading, and cutoff

***at Douglas Aircraft Co, El Segundo, Calif:*** **SECTIONAL DIES FOR HYDROPRESS SPEED WORK ON SMALL LOTS BY 175** man-hr per week. System eliminates wood patterns; works on parts with fairly flat planes that might otherwise be made on drop hammer. Steps include: flat pattern layout sawed into dural block (sectional), sections bolted to flat baseplate, inside radii filed smooth, clay mold poured over die, Cerrotru alloy poured into clay mold to make core, core filed smooth at outside radii, part pressed in hydropress

***at Harsch Bronze & Aluminum Foundry, Cleveland:*** **MEEHANITE PERMANENT MOLD RAISES TOP ALUMINUM-CASTING WEIGHT** to 780 lb. It looks like a bank-vault door, but it's for producing hollow aluminum turbo-blower rotors. Castings have to be chilled, which is simplified by collapsing iron core. Mold produces 300% more than sand casting with four operators instead of seven; cost about half the price of sand molds. Total mold weight is 25 tons. Fulton Foundry & Machine Co helped develop the mold

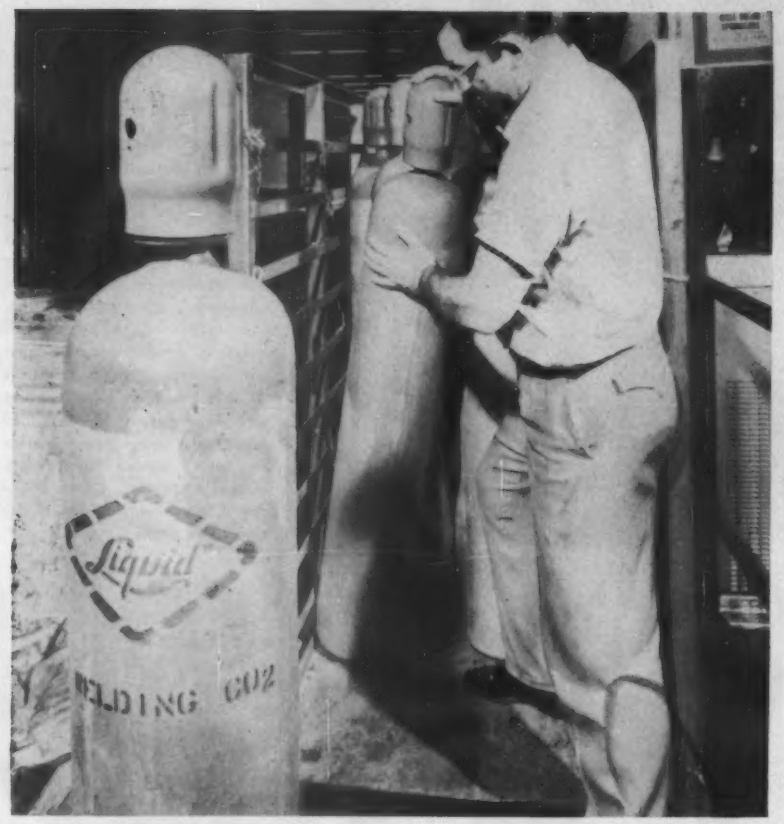


***at Colonial Broach & Machine Co, Detroit:*** **WORKLOADER FOR STANDARD MACHINE IS FIRST STEP** toward automation. Pull-down machine with 24-in. stroke broaches the ID's of gear blanks on 12-sec. cycle. Simple plate fixture riding between two rails is lever-operated from hydraulic cylinder (left). Machine is electrically interlocked to the fixture so broach comes down automatically after fixture has moved work into position. Only manual work is dropping part into fixture, tripping start button, and lifting out broached work



***at Douglas Aircraft's El Segundo plant:*** **SIMPLE TRACER TOOLING CUTS LAMINATED-MASONITE SPINNING CHUCK** on spinning lathe; replacing work in Tooling Department with high-precision machines. Transite (to right of operator's head) lines up flat-templet axis with lathe centerline. TruTrace hydraulic valve controls carbide toolbit from stylus that follows templet edge. Tolerances held are ±0.005 in.

# You CAN weld with $CO_2$



**GE does it at Bloomfield, N J, where they're producing packaged air conditioners for business and industry. $CO_2$ replaces expensive argon as a welding shield, and welds turn out better. Here's how they do it . . .**

Why pay $30 for a tank of argon when you can do the same job with a $4 tank of carbon dioxide? If you can make the weld properly—and GE can—the savings work out to 90%, because the $CO_2$ tank holds more gas than the argon tank.

Working with $CO_2$ takes about the same techniques as with argon, but with a few important variations. For one, the melting rate of steel (both work and filler wire) in $CO_2$ is much faster than in argon, so weld travel must be faster, as well as wire feed. Welding speeds are over 100 ipm, and wire feeds for the smallest wire sizes are as high as 1000 ipm.

Spatter has been a problem with $CO_2$; in fact, this is the main reason $CO_2$ hasn't been used much before. The solution is a short arc, often with the tip of the wire actually below the surface of the work being welded. This tends to heat the welding-gun tip, and water cooling is applied. Water cools the gun, and also reduces the amount of spatter that sticks to the gun.

Some spatter can't be avoided, and it builds up somewhat on the work; but the savings in gas cost can pay for a great deal more cleaning up than is necessary.

### NEW EQUIPMENT

The most important difference in welding practice between argon and $CO_2$ gas shielding is that the $CO_2$ requires a generator with a

**DOME IS WELDED TO TOP OF OUTER SHELL** with work positioned at 60°. Speed is 21 ipm, wire feed 210 ipm, current 350-400 amp, time 1 min 20 sec. $CO_2$ flows at 50 cfh. The 1/16-in. electrode wire used for all welds is mild steel with 0.06% carbon, 1.2% manganese, 0.5% silicon, 0.04% phosphorus, 0.015% sulfur, and 0.18% combined aluminum, zirconium, and titanium. The last three deoxidizing elements contribute greatly to good welds

rising volt-ampere characteristic —to produce the short arc and to hold it accurately. GE now uses special equipment on the air-conditioner line, but the company is presently manufacturing new automatic equipment especially for $CO_2$ welding. It's expected to turn up even more savings, once in operation at Bloomfield.

Air conditioners being welded are packaged units with three shell parts that must be joined. One weld can be made with a submerged arc; but the granular flux would cause trouble at the other two welds, so gas shielding is required.

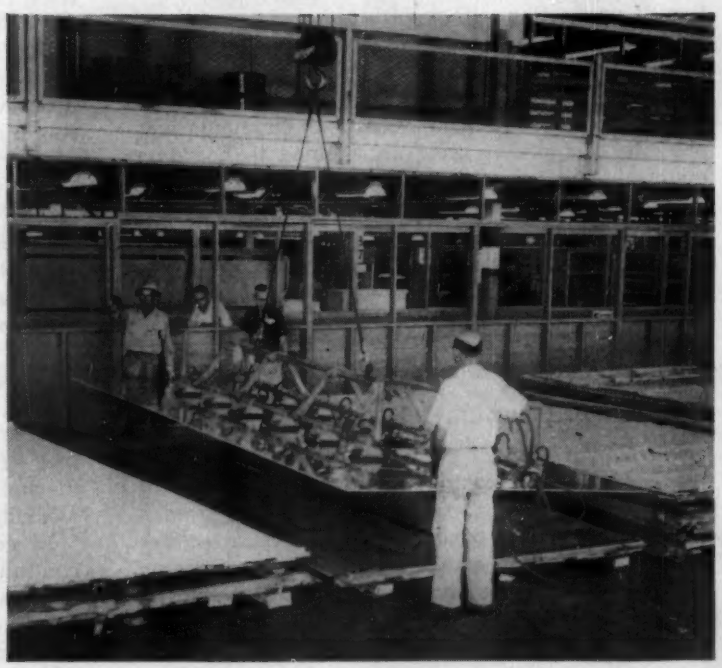
$CO_2$ has some advantages over argon, in addition to the obvious economy factor. Welds are now being made with good penetration and no porosity, which was not possible with argon. Also, when a reject turns up, rewelding is usually simple. Because of the $CO_2$ and the special filler wire used, rewelding can be done directly over the old weld without an expensive bronze overlay.

**OUTER AND INTERMEDIATE SHELLS,** lapped together in a hydraulic press, are welded under about the same conditions; time is 2 min 10 sec. One other weld that joins the intermediate shell to the dome is done with a submerged arc; but flux can't be tolerated inside the case or near valves, so $CO_2$ shielding was required for these two welding operations

# Suction cups ganged to handle big sheets

At San Diego plants for Convair Division, General Dynamics Corp, large sheets of aluminm-alloy stock, weighing 800 lb, 96 x 250 x 5/16 in., are handled easily. The lifting device, designed by Merle Stevens of Plant Engineering, Mechanical Design Section, and built by Convair maintenance crews, utilizes 12 suction cups suspended from a framework of steel. Air is forced into and out of the cups through a central control panel. Each cup is independent in its air supply as a safety factor in event one or more should fail. The machine is designed to handle loads of up to five tons, and each cup has a lifting potential of 400 lb.

Convair found that similar equipment on the market is too bulky. With this unit, savings were "several thousand dollars" over stock prices. Aluminum sheets can be moved, loaded, unloaded, suspended and turned while aloft for inspection.



**Struggling with the change from a peasant to an industrial economy, Soviet metalworking plants are making extensive use of continuous-flow production methods, less extensive use of automation. From a study of Soviet technical literature and interviews with expatriate engineers comes this answer to . . .**

# *how much automation in*

DAVID GRANICK, associate professor of economics, FISK UNIVERSITY, NASHVILLE

In the early 1930's, when Soviet leaders were beginning their expansion of Russia's metalworking industries, they saw the economies achieved through American volume production, and chose the US example over the small-batch methods of western Europe. Despite this choice, the American savings in equipment, labor, and materials eluded them throughout the prewar period.

The reason for this failure is plain: continuous-flow methods of organizing production were not, and could not be, introduced. Even the auto industry had scarcely made a beginning by 1941. In the two largest and most progressive automotive plants, ZIS and GAZ, continuous-flow production was limited to a few assembly operations.

The '30's was a chaotic decade for plant management, with a fantastically high turnover rate. Official Soviet studies showed that 25 to 35% of plant directors held their jobs for less than one year, and only 3 to 8% for more than five years.

Stress placed on achievements by individual workers prevented significant efforts toward synchronization of production, either within or between shops. Procurement of materials and parts by plants was poorly organized; allocation orders were needed, and these were usually given out for an entire year. No regular scheduling of materials' shipments was possible, and plants grew accustomed to hoarding materials and to constantly "making do" with substitute shapes, tolerances, and qualities. Equipment maintenance was at a low level, for the amortization system in use penalized proper practices.

To some extent this condition may be inherent in the Soviet Union's type of economy, but to a large extent, the problems were those of building a large industry rapidly in a peasant country.

### THE TURNING POINT

World War II made continuous flow a "must" for the Soviet metalworking industry. Scheduling of shipments between shops was first shifted from a daily to an hourly basis; only when these tighter schedules were met could the still tougher tasks set by continuous-flow production be realistically tackled. Equipment which had formerly been grouped by type was regrouped by product.

Continuous-flow methods were introduced into production processes on a large scale early in 1942. For large shells, simple "operational" machine tools were the main equipment used on continuous-flow lines. These were cheap to produce, could be operated by relatively unskilled workmen, but were not adaptable to changes in design specifications. Small shells, with far greater output, were made mainly on automatic machine tools. In small-shell plants, continuous flow was achieved for the operations performed by a group of automatic machine tools, sometimes for a whole shop, and occasionally even for an entire plant. Inspection work (performed manually in the main) soon became the principal bottleneck. As a result, there was widespread introduction of automatic, semi-automatic, and other electrical equipment for inspection purposes.

### POSTWAR PROGRESS

The postwar period saw particular progress in the motor-vehicle and freight-car building industries, not only in metal cutting, but also in casting and forging.

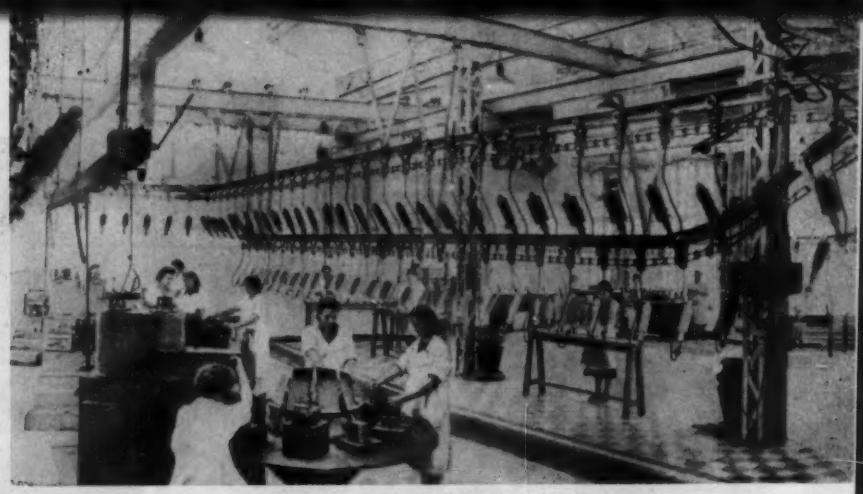
By 1949, 18.5% of the output of the Ministry of Machine Tool Building was produced by continuous-flow methods. During 1952 and 1953, 80 continuous-flow lines, with a total conveyor length of two kilometers, were set up in plants producing agricultural machinery. At Kolomna, a major locomotive plant, an increase of 82% in production between prewar and 1950 was attributed primarily to continuous-flow methods.

A major cutting-tool plant, Freezer, put 22 lines into operation between 1947 and 1950 and transferred 36% of its tool production (96% of taps) to these lines. A major measuring-tool plant, Kalibr, primarily through continuous flow between 1940 and 1950, increased its production per square foot of floor space by 230%, its production per machine tool by 60%, and its annual turnover of working capital from 1.7 to 3.75.

In work areas where the complete foundations for continuous-flow operations have not been laid, large manpower and equipment reserves are used to maintain the flow of production.

Thus, in the major automotive plant ZIS, an "in-

# Russia?



**PRECISION CASTING PLANT** of the Podolsk Machine Plant. Conveyor line carries wax casts for sewing-machine shuttles

stitute of universal machine operators" has been created as a labor reserve for the continuous-flow lines. The operators in this "institute" are available to replace regular operators on the continuous-flow lines when "adjusting" work is needed before the next operation. This labor reserve was needed because of failure to achieve proper tolerances before continuous-flow methods were introduced.

Much has been claimed in the popular Soviet press regarding accomplishments in the field of automation of machining. However, Soviet automatic machine-tool lines are essentially transfer machines; they are not constructed around an electronic feedback system.

Soviet automatic machine-tool lines are of two types. The simplest is formed from semi-automatic equipment already existing in the plant and is usually composed of only four or five machine tools. The important First Bearing Plant has combined 40 multi-spindle semi-automatic and 14 single-spindle lathes into a number of lines for turning bearing rings.

More complex automatic lines use new and especially designed multi-position tools. Even these lines, however, normally do not include more than ten multi-position machine tools.

In November, 1953, there were "over 40" specially designed and built automatic machine-tool lines, mainly consisting of multi-head machine tools. In addition, there were quite a number of other automatic machine-tool lines which had been built from individual machine tools already in use.

Of the identified automatic lines, eleven are in two automotive plants (four for machining cylinder blocks, at least two for grinding piston pins, and one for grinding the faces of piston rings); four are in plants producing tractors; seven were put into production during 1952 and 1953 in the agricultural-equipment industry; one was introduced in 1953 for the production of nuts and bolts; and several are for machining axles and wheels for railroad cars.

In addition to these lines, two Soviet automatic plants have been reported. One is used for producing anchor chains. The other is an automatic piston plant, which in 1950 had a daily output of 3000 to 3500 pistons, serviced by five persons in each shift.

### SOVIET SELF-CRITICISM

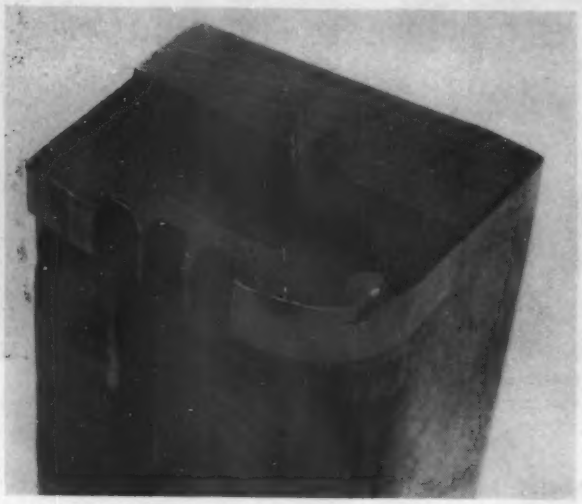
One Soviet author, writing in 1950, was critical of many automatic lines because of line-shutdowns from idleness of individual machines. He reported that sometimes all the advantages of a line's automation have been lost through idleness as a result of tool failure or insufficient synchronization of supplies and repair work. In order to keep such idleness to an acceptable minimum, the author argued, the quality of the machine tools and of the tool accessories on an automatic line should be higher than the quality needed for non-automatic lines.

In 1954, the complaint was made that complex automatic lines take a long time to produce—sometimes up to five years.

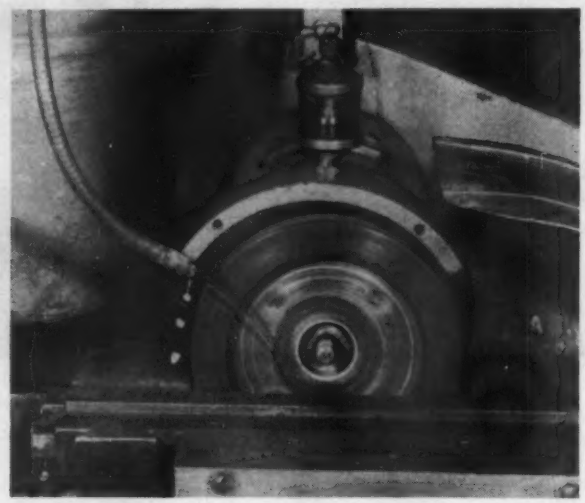
Prokopovich, a Stalin Prizewinner, wrote in 1953 in a highly discouraging fashion about Soviet experience with automatic machine-tool lines. Machine-tool lines are created for the production of only a single specific item, he wrote. In each case it has been necessary to design and to experimentally check each of the units of equipment as well as the line as a whole, and to produce the equipment in unit-type production. As a result, the creation and installation of automatic lines have required a long period, the cost of the lines has been comparatively high, the lines themselves have often proved unsafe and individual mechanisms have had to be replaced. Because of these difficulties, Prokopovich declared, "only a limited number of automatic machine-tool lines have been built."

### *About the sources . . .*

This study of Soviet production methods is a sequel to "How many machine tools in the Soviet Union?" (*AM*—Apr 11 '55 p 118). The author has specialized in the Soviet field, including study at the Russian Institute of Columbia University and under a Social Science Research Council Fellowship. Documentation for this article will be found in his study, "Postwar Technological and Organizational Developments in Soviet Machine Building," published in *The Soviet Railroad Equipment Industry: A Technological Approach to Economic Analysis*, Institute for Research in Social Science, University of North Carolina, October, 1954



**THERMAL SHOCK** produced by poor grinding practice cracked this expensive formed tungsten-carbide tool. The fine crack traverses the face of the carbide and makes further grinding impractical



**USE A CONTINUOUS FLOOD** of coolant on silicon-carbide wheels. If coolant flow is reduced, there is alternate heating and cooling of the work, increasing the danger of cracking the carbide tool

# Should I Grind Carbide Wet or Dry?

JOHN RIPPLE, sales engineer
bonded abrasives div, THE CARBORUNDUM CO.
NIAGARA FALLS, NY

**It has long been a vexing question, and their opinions. Actually, there is an**

**DIAMOND WHEELS** require less coolant than silicon-carbide wheels, and this can be delivered to the working face of the wheel by a porous wick connected to a reservoir and bearing on the wheel face

There is no one answer to that question. Perhaps for that reason, it is one of the most live subjects today. There are so many ifs, ands, and buts involved in the solution that a careful study must be made of the conditions in a particular shop, and even of each particular machine in a shop, before the proper answer can be reached.

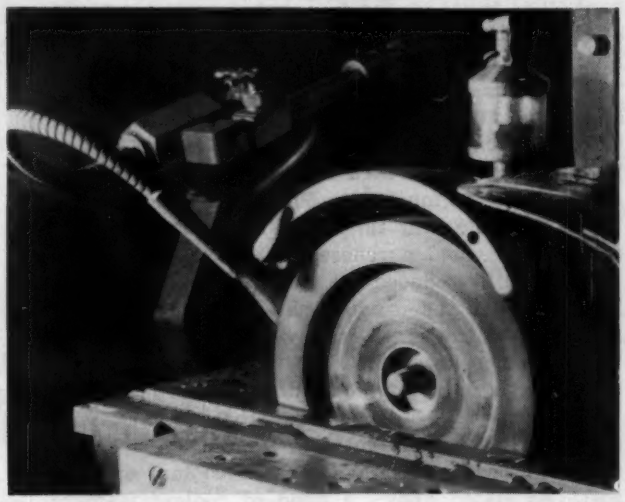
An understanding of the factors concerned will assist in coming to a decision for each case. These include the type of abrasive, the bonding, the construction of the machines, and even the attitude of the men in the shop.

Both silicon carbide and diamond abrasives are used, and the former is perhaps the more confusing because equally competent authorities appear to stand on both sides of the fence. It is when we examine the question closely that we find no real disagreement on principles, but rather, different approaches to a practical solution.

Both agree that it is better to grind carbide wet with silicon-carbide wheels, but only if a flood of coolant can be maintained. With a heavy flow of coolant, tools remain cool and cracking is reduced. It is also possible to use a harder grade of wheel with resultant economies because of reduced wheel consumption.

But tool grinding under a flood of coolant is some-

**ADJUSTING THE STOP-COCK** so fluid drips onto the wheel at a controlled rate is effective with diamond wheels. This is comparable with the wick system and produces about the same cooling action



**MIST COOLING** is highly effective on diamond wheels, and consumption may be as low as a pint a day because the air also does a good cooling job. With proper adjustment, the liquid will be evaporated instantaneously, thus keeping operator dry

**authorities appear to differ in answer, and you'll find it here**

times untidy. There may be splash and splatter around the machine and, even though the operator wears a rubber apron, he may end the day with wet clothing and shoes. This leads to a natural tendency to reduce the flow of coolant, and we are then immediately in the danger zone.

Heat shock—the sudden rise or lowering of temperature—is one of the greatest enemies of cemented carbide. When it is ground with silicon-carbide wheels using a "token'" stream of coolant, there is alternate heating and quenching of the work and an increase in probability of grinding cracks.

Certain machines are well adapted to a heavy flow of coolant and, in general, should be used wet. These include some surface grinders, centerless grinders, vertical-spindle surface grinders, cylindrical grinders, internal grinders, and a few other types.

Some machines are borderline, and conditions in a shop will determine whether they are to be used wet or dry. These include offhand tool grinders, various semi-automatic tool grinders, a few types of cutter grinders, and some universals.

Machines which are almost always used dry with silicon-carbide wheels include the majority of tool and cutter grinders, some types of surface grinders, profile grinders, and such machines as cannot well be equipped with adequate water guards.

However if a machine is available that can be properly water guarded, the consensus is to grind wet—very wet. On other machines it is advisable to grind dry—entirely dry. There can be no middle ground if the tools are to be protected.

When tungsten carbide is ground with diamond wheels, the factors become more involved but, fortunately, all end up with the same answer. It can be summed up quite readily: Always grind wet with diamond wheels.

When using metal-bond or vitrified-bond diamond wheels there is almost no compromise to be made with that statement. Those bond types are long lasting, but relatively slow-cutting, and if they are pushed they may crack costly tools. They can safely be used dry only when they are "babied" and used lightly.

There is little opposition to this, and almost all shops use metal- and vitrified-bond diamond wheels wet. On machines where it is impractical to grind wet, these bonds are avoided.

The quantities of coolant necessary are much less than with silicon-carbide wheels and, while a heavy flow of coolant is the ideal condition, quite satisfactory performance can often be achieved with lesser amounts, such as are found in drip, or wick, or mist systems.

Resinoid-bond diamond wheels should be used wet for another reason. These wheels generally cut freely enough that there is little danger of cracking the carbide unless the wheels are pushed too hard. To further reduce this chance, but even more to protect the wheels, some coolant should be used with resinoid-bond diamond wheels.

Temperature at the point of contact between wheel and work is estimated to exceed 1000 F and resins cannot stand such heat.

Most of this heat is dissipated into the air and

conducted away by the tool, but a certain amount of it is stored up in the wheel, building up temperatures in excess of what the wheel can stand.

When this occurs, the bond burns or chars, becomes brown, then black, and loses its strength. In this condition the diamonds are pulled out before they have completed their useful life, and high wheel costs result. As much as a 50% reduction in wheel life is possible and this, in turn, means a 100% increase in wheel purchases.

This can be reduced by several means. Of great importance is the use of heat-conductive backing materials which assist greatly in conducting away the heat of grinding. Special, soft, free-cutting resin bonds may also be used to reduce the heat generated. Wheels may also be operated with extremely light cuts and long pauses between passes.

But more effective than these is coolant of some sort. As stated above, a flood of coolant is more effective but often impractical. Drip or wick systems can often be used and produce good results.

The use of the relatively new mist systems removes much of the remaining valid objections to coolant. With these, a stream of compressed air is directed into the cut, carrying with it an atomized spray of liquid. If too heavy a spray is permitted, it may result in the same undesirable wet conditions that have caused operator opposition to wick and drip systems. However, if the liquid is reduced to as little as a pint a day, there is instantaneous evaporation, and completely dry, clean work and table result. This small amount is enough to be effective when combined with the air stream which, in itself, does a good cooling job.

The one remaining objection is the hiss of the compressed air, but this is minor when compared to the hundreds of dollars which can be saved.

With adequate coolant, it is possible to avoid the soft resinoid bonds and to use the harder, long-lived resinoid bonds which not only reduce wheel consumption but also provide better form-holding quality which is so important in many cases.

There now remain few operations so involved, and few machines so intricate, that coolant of some sort cannot be used to reduce that great enemy of the diamond wheel—heat.

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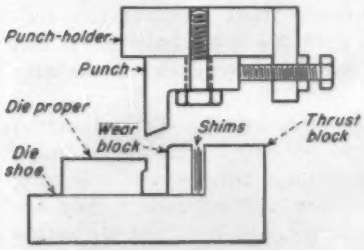
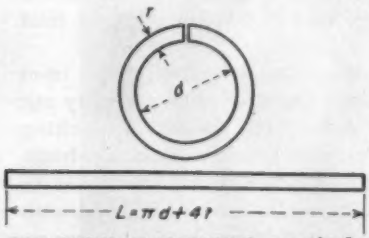
# DIEMAKER'S KINKS

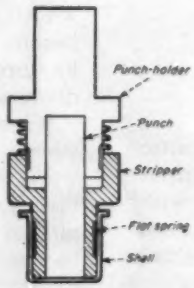
FEDERICO STRASSER



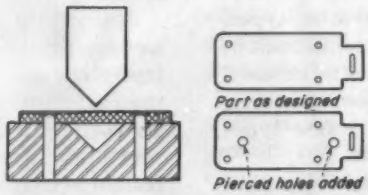

**SHEARING PUNCHES** should be adjustable, to compensate for grinding when they dull. Use an elongated hole in the punch for the clamping screw, and back up the punch with a screw adjustment. Also, provide shims behind the wear block or heel.



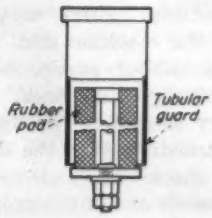

**FOR TUBULAR ELEMENTS** practically closed, the length of the blank $L = \pi d + 4t$, or the inside circumference plus four times the stock thickness.



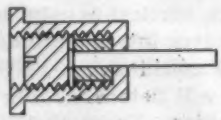

**PIERCING** a concentric hole in the bottom of a shell can be done with a movable stripper as the locating or guiding means. Thus, the need for a nest may be overcome. A couple of weak flat springs in the body of the stripper will help to maintain the shell in the correct position.




**BLANKS** are best located for bending by means of pierced holes. If suitable holes are not part of the product design, they may be added in appropriate positions, when function or appearance of the part are not adversely affected.




**WHEN RUBBER PADS** of strippers, shedders, knockouts and similar devices are made of natural rubber, they should be protected from oil and grease. A tubular metal guard can be applied.



**SMALL PUNCHES** may be reground many times if they are provided with a bushing in the punch holder. Every time the punch is ground, a similar amount is removed from the bushing, so that the punch height remains the same.

**American Machinist**
SPECIAL REPORT NUMBER 411

# GREIST'S MONEY-MAKING FORMULA:

# *Build skilled work force to get the most out of new machines*

RUPERT Le GRAND, senior associate editor

## What would you do if . . .

- ▶ Your business was small and making little money?
- ▶ Your equipment was old, methods antiquated?
- ▶ Materials-handling costs were high?
- ▶ The plant was a jumble of multi-story buildings and additions?
- ▶ Work-in-process inventory was high?
- ▶ Tool engineering and shop personnel needed to be brought up to date?

## . . . But you had a good product and a chance for growth, provided you could maintain a competitive edge?

Maybe these questions come uncomfortably close to your situation. Or partly so.

To see what the other fellow has done by changing to modern methods and plant, consider the Greist Manufacturing Co, New Haven. Here is a concern that has literally pulled itself up by the bootstraps since 1946, has paid off a new plant in three years, and is still going places. Details begin on next page.

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# *Greist attacked modernization*

An unflinching determination to modernize can accomplish wonders in the outlook and profits of a metalworking plant. Only 12 years ago, the Greist Manufacturing Co, New Haven, was a typical example of a third-generation enterprise. To become up to date, it needed an overhauling from top to bottom. That's what it got. Here are the results:

| | 1955 | 1947 |
|---|---|---|
| **Net worth** | **$5,000,000** | **$800,000** |
| **Sales** | **$7,500,000** | **$700,000** |
| **Employment** | **532*** | **130** |
| **Plant** | **New** | **Antiquated** |
| **Machinery** | **Modern** | **"** |
| **Annual replacement expenditure** | **$250,000** | **None** |
| **Expansion** | **Needed** | **Unnecessary** |
| **Contract work** | **Plenty** | **Very little** |
| **Morale** | **High** | **So-so** |

*Would be over 1200 people, using 1947 methods and tooling.

These results are not happenstance. They are the direct result of a happy combination of a financial man who knows that good methods and a good shop make money and of a manufacturing executive who worked in the shop as a youth and who got much experience by holding a number of posts throughout the organization before he became an officer.

These men could have played it safe and been satisfied with a long fade-out of the picture. Greist had the sewing-machine attachment business sewed up tight: it held the basic patents, it had produced parts thus far at costs such that it was the only supplier to all domestic and foreign manufacturers.

But President Vanderbilt and Vice-president Greist did not look at things that way. They figured there would be a boom in home sewing, and that women would buy more and more attachments to do some of the fancier kinds of work. Also they wanted to build up a real shop, get rid of antiquated equipment and an old multi-story building, and grow and diversify. Lastly, they wanted to make the plant a really good place in which to work by modern standards.

How did they go about modernization? Well, there were three simple phases: (1) to assess what they had, (2) to lay out a modern manufacturing setup and plant, and (3) to erect the plant and buy the equipment they needed.

Step 1 was easy. The plant was a multi-story building with high materials-handling costs. Annual turnover of inventory was only 2 times per year. (It is now 5 times and the volume is 10 times greater). Machining equipment was single spindle. Presses were set up with simple tools, often requiring 9 or 10 operations to complete a piece.

Step 2 was the hard part. It took three years to plan exactly the kind of one-story modern plant that should replace the old structures. Meanwhile, people had to be upgraded in skill, tool engineering skill had to be hired and employees trained. Supervision had to be modernized too. And workers had to be shown that improved methods would not cut employment but instead raise potential earning power and job opportunities.

Steps 2 and 3 of the modernization job actually merged; they took three years to accomplish. Originally, it had been thought that 10 years would be needed and it was hoped to finance the plan out of savings in manufacturing costs. Yet new business opportunities, plus profits from new methods, worked together to speed the process. The job was done by tearing down and building piecemeal, even moving departments several times, but not a day's production was lost. Planning was aided by a scale model of the plant with its proposed new equipment.

**Greist management believes that the $3,000,000 modernization program paid for itself in three years. It is now committed to spend about $250,000 per year for replacement purposes, and it will buy any machine that will pay for itself in three years. In addition, machines will be purchased if they produce better quality or have desirable safety features.**

Strength begets strength. By demonstrating ability to take on the tough jobs and to make a high-quality product, Greist was able to land the contract to make the mass-production model of the Polaroid Highlander Land camera. It also makes other contract products. It bought out the Fairfield Gage Co, and it acquired the Air Marine Motors Corp in a stock deal. Further expansion of its New Haven plant is needed right now. The new structure was purposely built to push out the end wall.

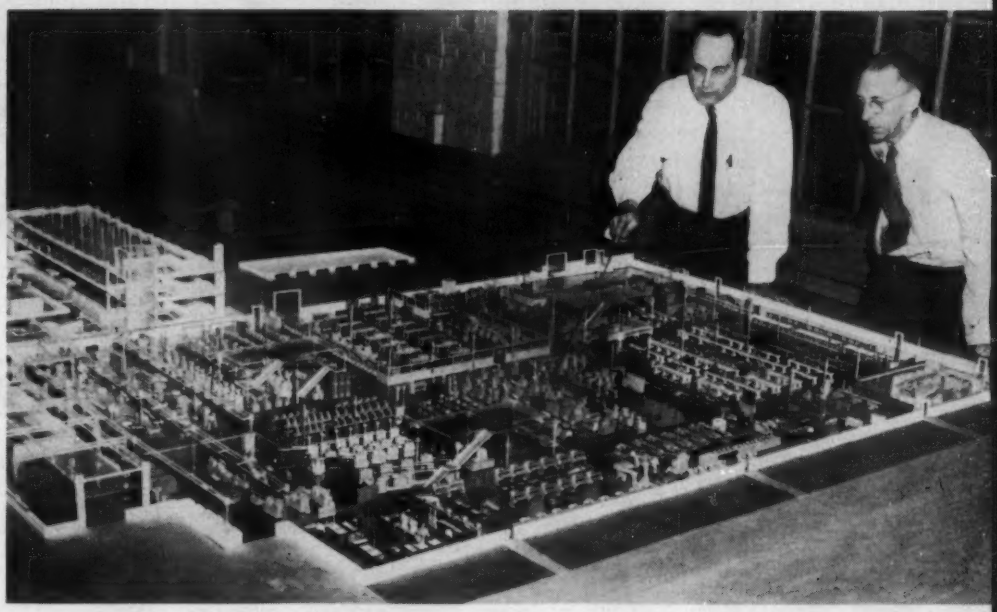
Tools, machines, plant are not the only aspects of a true modernization program. People in the organization are encouraged by management to upgrade themselves by out-of-hours training programs. Men attend the New Haven College for certain courses, they go to out-of-town technical and management meetings, make visits to other plants. Psychological testing is made available, and reading courses are suggested. In other words, supervision has been and is being retrained. The policy is to train within and promote from within.

The key to shop skill, however, lies in the toolroom. Therefore, Greist has an apprentice train-

# . . . on a broad front

**Model layout . . .**

**Sales manager P Phelps and plant engineer L Miller look over the scale model of the present one-story Greist plant. The scale model visualized for everyone concerned the new equipment required and the best layout for modern "straight-line" production. Finishing departments parallel the fabricating departments (primary operations like screw machine work and press work followed by secondary operations) and assembly areas. This scale model is kept up to date, because constant modernization and replacement are now part of Greist policy**



ing program. Boys are carefully screened by interview, then given a psychological test by a professional organization. When placed in the toolroom they are carefully taught by the foreman, and must pass several review tests after stated periods of instruction. Out of this group, the company expects to recruit the shop leaders of tomorrow.

Operators are carefully instructed in their duties and most are paid on a piecework basis. Statistical quality control keeps a tight rein on standards, but employees are then free to realize as much take-home pay as possible.

A profit-sharing program, open to all, was instituted 5 years ago and has already paid out $2,600,000—half directly and the balance into a deferred fund that may be looked upon as a pension.

The plant is thoroughly modern and is kept clean by a rigidly maintained sweeping schedule. Also, operators are given time to clean up their machines. Illumination is 80 ft candles (the McGraw-Hill photographer did not use a flash gun for most of the accompanying pictures).

All in all, experience in the recent flood indicates whether enlightened management pays off. More than 150 male employees came down to the plant (flooded with 16 in. of water) on a Sunday night and helped to prevent damage to stock, tools and machines. Some worked straight through until Wednesday without asking for pay. The result: actual damage was held to a small fraction of the potential loss—the plant was fully operational by the 6th day.

Other pages give examples of how Greist made new machines pay for themselves in 2 yrs or so.

## Quality control spurs modernization

When a shop knows precisely what is taking place quality-wise—both in fabricating processes and in assembly—the proper steps can be taken to improve methods, reduce waste and avoid customer dissatisfaction.

At Greist, statistical quality control has been in operation since 1942, and its application has been continuously developed since. Now, these results can be shown:

**1**. . Any given process can be analyzed to improve quality to the desired level—say 3% defective parts or assemblies, or less.

**2**. . Any drifting from the desired quality level is quickly reported, the cause determined, and corrective measures taken.

**3**. . A capability study can be made of any job giving trouble, pointing to the need for a better machine, a better tool, or any improvements needed.

## GREIST'S MONEY-MAKING FORMULA:

**4**..A more realistic attitude toward product specifications and purchasing may be developed in a number of instances. Example: for years, a rivet dia was specified ±0.001, requiring a screw-machine product. Actually a ±0.003 tolerance was suitable, permitting a change to a less expensive cold-headed product.

**5**..The cost of inspection per unit and the percentage of rework has gone down. Today, as in 1946, inspection accounts for 10% of the shop force, but production volume has gone way up.

**6**..With the passage of time, quality control plays its part in raising the general efficiency and ability of the shop. When the source and cause of defective work are pinpointed, alert tool engineering and management seek to provide better tools, better machines and more advanced methods in general. These in turn lead to greater productivity plus greater ability to take on and whip even more involved manufacturing problems.

**7**..Shop morale is raised. The need for operator training is revealed. The properly trained operator makes more money under the piecework system; the plant earns enough more to supply various benefits plus good wages.

The Greist quality control program started out with replacement of the old inspection procedure (pass a 100-unit lot if 2 defectives, reject with 3 defectives) with a double sampling plan. The old plan allowed 20% defectives to pass.

As time passed and experience was gained with Dodge & Romig sampling tables and Mil Std 105, the stage was set by postwar to make more advanced use of statistical quality control. For example, at the outset of production on a given part, 100% inspection is applied until a given number of acceptable pieces are produced. When this occurs, 100% inspection is discontinued and only samples are taken in a predetermined manner.

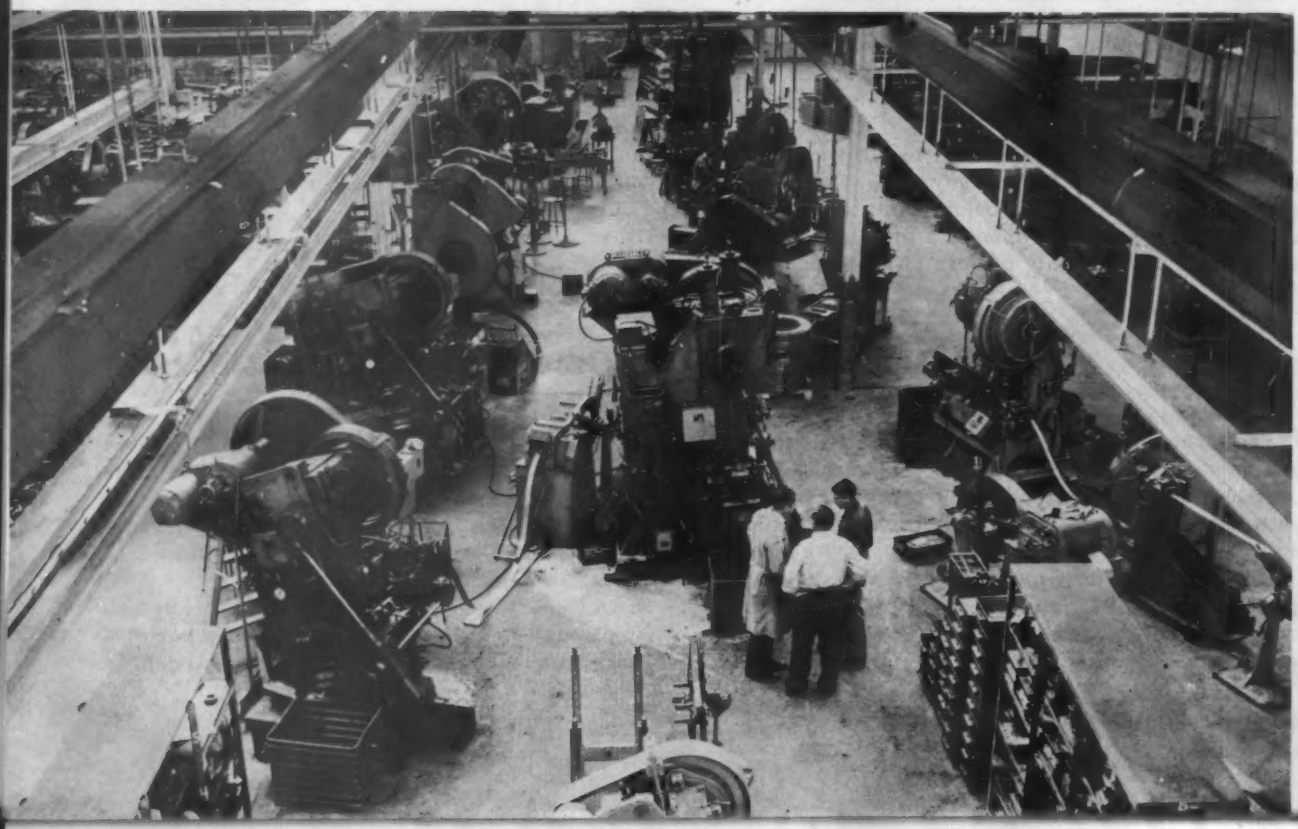
For assemblies, the number tested is determined by the process average and the desired quality level desired. The better the part processing, the less the assembly inspection required. However, any deviation from the norm immediately calls for 100% inspection again until the trouble is cleared up.

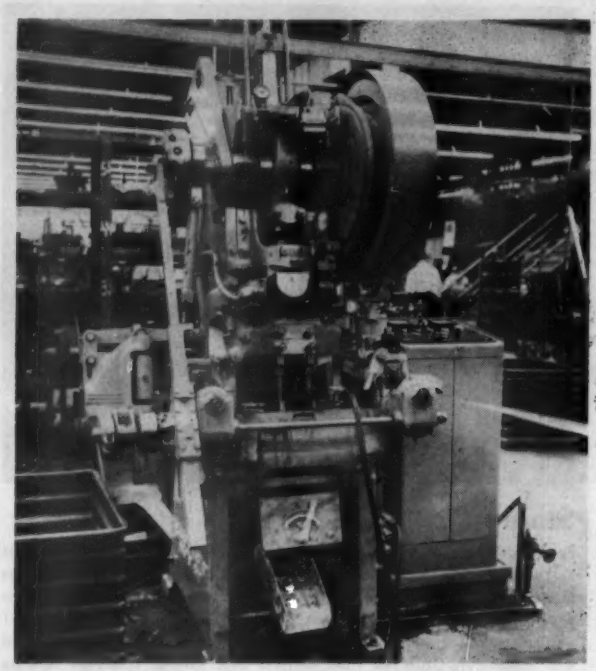
The strength of quality control lies in the reports that are issued to shop, engineering and management. Normally reports are issued on a monthly basis. The charts and graphs supplied show:

1. The number of rejects
2. The various faults and the percentage of individual faults to the total

These graphs normally stimulate an improvement trend. However, when any sudden change for the worse occurs, special daily bulletins are issued until the fault is cleared up.

# *Modernized pressroom cuts costs*





## Minster 22-ton press

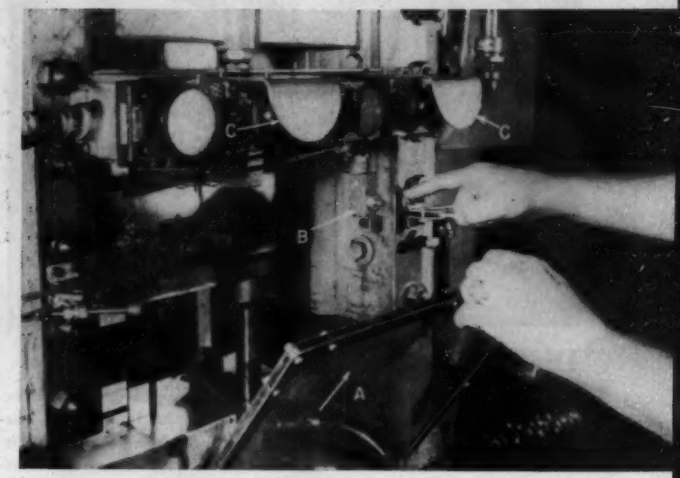
with air clutch and air brake has variable-speed drive, affording 50 to 250 strokes per min. Job shown is running at 125 spm. These features allow press to be run at best speed for the job and to get maximum output *vs* die life, instead of being limited by press speed. Compared to old fixed-speed press it replaces, the Minster will pay for itself in four yr . Air clutch is adjusted to just hold, then pressure is raised 5 to 10 lb. If any problem arises with stock, the clutch slips and the press stops. Two feed rolls pull or push, pulling in this case to suit job (a compound die—no stock guides). Here the right-hand feed roll is adjusted merely to keep buckle out of strip

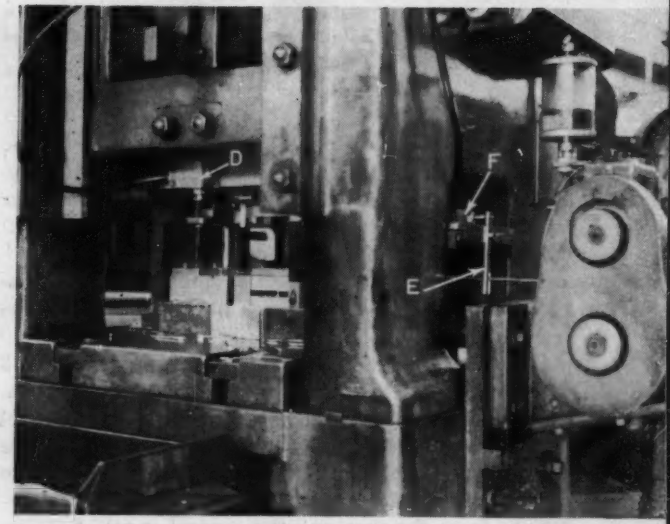
Greist tried its first progressive die in 1936. Today, over 1000 active dies are in use, and most of these are progressive tools. On the average, jobs are set up 13 times per yr. Dies run off 50,000 pc approximately, and then are repaired and ground, tested on the toolroom's presses, and replaced in die storage with an inspected sample part.

No press operators are used in the pressroom proper. A foreman, 3 stock men and 2 setup men operate the department. All of the 19 presses run

## Entirely automatic,

nineteen presses perform primary operations on Greist parts, using progressive dies for most jobs. Eight years ago, 100 operators worked on secondary presses, now only 30 are needed on such work, despite the great increase in volume. Progressive dies, taken as a whole, reduce parts costs by 75% as compared to use of kick and bench presses. All presses are now equipped with air clutches as a safety measure, necessitating installation of an additional compressor. Machines are angled at 15° to 30° to center aisle to allow up to 10 ft space for stock straighteners, feeds and scrap cutters. Also, presses are placed under an overhead crane that supplies coil stock, removes scrap, and is available to remove the flywheel, bolster, etc, when press repairs are required




## Adequate guards

for personnel and for die safety must be applied to press that makes screwdriver blades in progressive die. *At front*—Lucite panel *A* is hinged at bottom, held in place at top by quick-acting clamps and holds closed the Microswitch *B*. If die setup man opens panel, the press stops. Steel guards *C* (of ⅛-in. steel for strength) over start buttons cannot be stripped by accidental contact; the fingers must be inserted under the guards to actuate the buttons. *At rear*—Microswitch *D* will be tripped by spring pad, if latter is held up from die face by a slug or a finished part that has not been removed, thereby preventing a die smashup. Pivoting arm *E* has a slot through which wire stock passes. A buckle or kink that would jam the die kicks the arm to one side, and it slips off the Microswitch *F*, causing the press to stop. Screwdriver blades are now made in 3 operations instead of 11, and a lot of stock is saved

**Dial indicator**

gages are preferred for checking stampings, as compared to attribute gages, because a definite measurement is secured. In this case, the rise on the multi-lobe barrel cam for the buttonholer attachment is being checked. With automatic press operation and progressive or compound dies many more inspection gages are required. But with modern quality-control methods, the actual cost of inspection is lower, as witnessed by a far larger volume of production handled by the same number of people as formerly

**Stampings**

are inspected with a Kodak optical comparator every time a job is set up and several times during the run (for 50% of different parts manufactured). Here the spacing of slots in a ruffler and their squareness with a formed foot are being checked against a 20:1 enlargement. The comparator is equipped with micrometers and end measuring rods so that heights and lateral spacings can be checked to tenths if desired

automatically. They have all been rebuilt with air clutches for safe operation with expensive tooling, and only three presses predate 1947. Stock reels, feeds and scrap cutters are applied. Modern coil handling reduces the amount of effort.

Some examples of product savings by use of progressive dies, or redesign of a part to use a stamping and screw-machine part are:

Gathering Foot—This part was formerly made in 3 operations. Now it is made complete, 2 pc per stroke.

Buttonholer Cam—This part, a multi-lobe barrel cam, was milled. Today, the two end pieces are stamped, the center part is a screw-machine product made for ring staking the assembly—2 end stampings to form the cam and the central spool. Savings —$50,000 per yr on this one high-output piece.

Ruffler—By product redesign, two variants are now stamped in progressive dies, instead of seven. Progressive tooling saves two-thirds of the labor and material cost of the former production method —a rather important saving on an item that runs to over one million pieces per year.

To sum up, modern presses with progressive tooling accomplish these results:

1 . . A 75% average saving in labor.

2 . . A very important reduction in use of kick and bench presses.

3 . . Far fewer accidents to personnel.

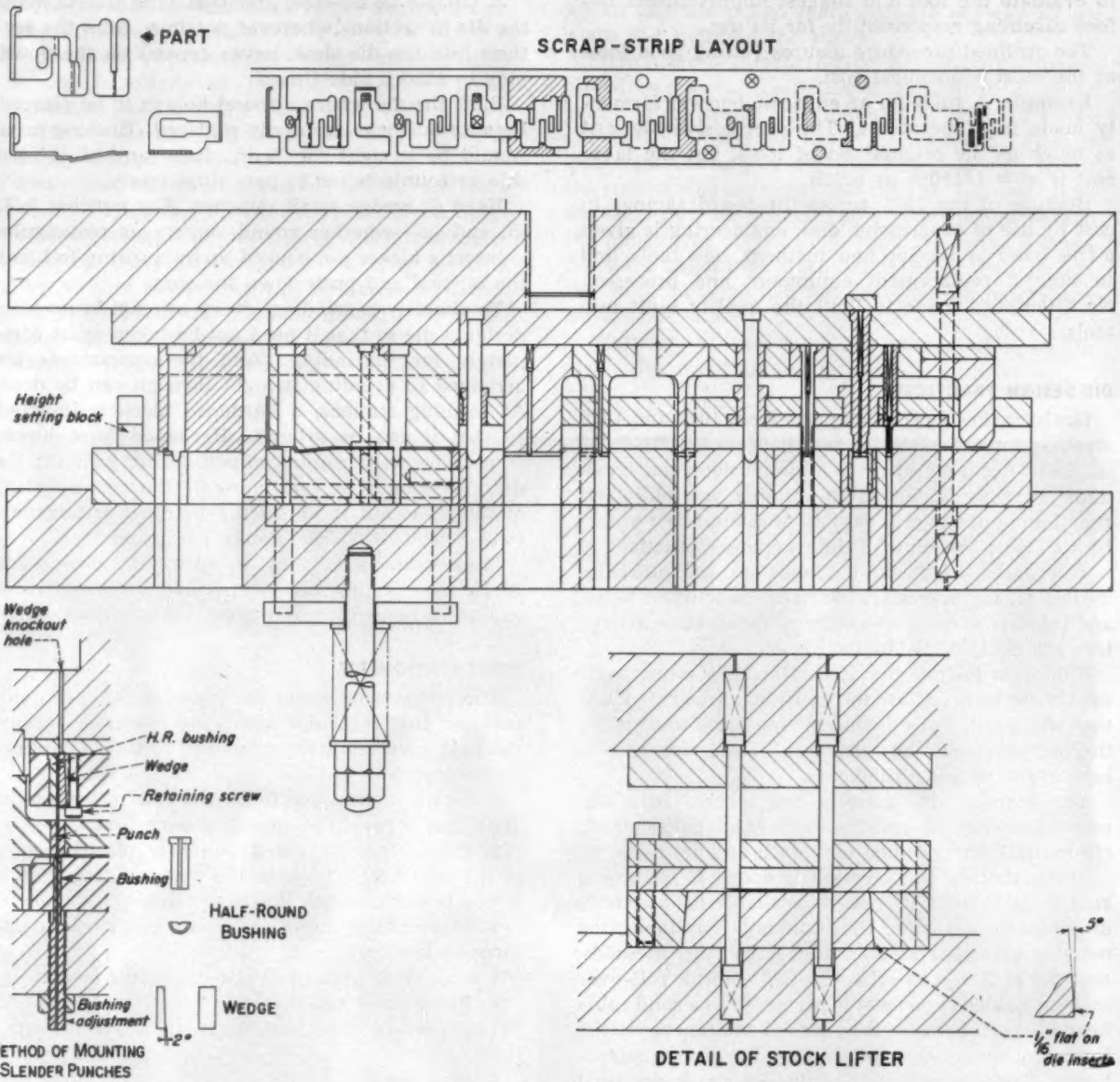
4 . . A reduced inspection and materials handling load.

# *Work quality and lower costs spring from*

Tool engineering at Greist is applied mostly to methods improvement on existing sewing-machine attachments, and the development of tools for new attachments devised in the model room. Tool design for contract work is assuming more importance, too.

Part prints from Engineering or the customer are examined, and a "Tool and Manufacturing Estimate" is prepared by the chief engineer. Data entered are: operations, description of tools, tool-design hours, toolmaking hours, tool-material costs, part-material costs, etc. This form is then checked by the chief tool designer, especially for tool design, weight of material, etc. After the cost department reviews the figures, they are transmitted to management for approval of the expenditure for shop tools or to the customer, in the case of a contract job.

The cost department reviews the estimate, because Greist buys 95% of its tools from nearby approved independent tool and die shops, and the labor charges of these vendors vary with seasonal demands. The plant's toolroom of 40 men is engaged




# *good tool design*

principally on tool maintenance and special jobs. A tool room capable of handling all of Greist's work during peak periods would require 100 men, obviously an impractical setup.

Complete control of tool quality is assured by these factors: (1) all tools are designed by Greist and (2) initial production runs, up to 1500 pc at least, are under the jurisdiction of and remain the responsibility of tool engineering.

Approved jobs, captive or contract, are given to Tool Engineering for actual tool design. A progressive die may require from 4 to 60 hr of design time, from 90 to 400 hr of toolmaking time, depending on complexity. Four sets of prints, after approval by the chief engineer, are sent to Purchasing, with a recommendation by the chief engineer of which tool shops are best qualified to build the die.

When the vendor completes the tool, he makes part samples from stock supplied by Greist. Inspection next reports to Engineering if the samples are to print. If so, the latter department requests delivery of the tool.

Upon receipt, the die is taken apart in the toolroom, inspected, re-assembled, tried out in presses kept in the toolroom for that purpose. And Inspection watches this process, again checks sample parts. Vigilance by Inspection and Engineering is maintained until the aforesaid 1500 pcs have been produced. During this time, Production has a chance

to evaluate the tool and suggest improvements before assuming responsibility for its use.

The outlined procedure assures getting good tools at the most economical cost.

**Example:** A guide for an edge stitcher was formerly made in 9 operations. The progressive die cost as much as the original set of tools, but the labor cost is now 1/100th as much.

Because of the 75% across-the-board savings in cost by use of progressive dies, engineering is given a free hand to develop new methods, new tools, and to suggest replacement equipment and processes. No attempt is made to limit the quality built into tools.

#### DIE-DESIGN PRACTICES

Greist makes most of its parts from 1010 and 1020 steel, and many parts are case hardened 0.003-0.005 in. deep. Accuracy of product dimensions and minimum burr are essential to suitable assembly and functioning of the product and minimum cost in finishing. Here are some of the company's practices:

Tolerances on decimal dimensions are normally ±0.003 in. for over all dimensions, spacing of holes, and relation of holes to datum surfaces. Hole diameters are held to ±0.002 in.

Minimum burr is required, especially when parts cannot be tumbled in the finishing process. Parts that will touch cloth during sewing or be touched by the operator must be burr free. Total clearance is held at 6% of metal thickness.

To eliminate die troubles and increase die life, non-deforming, air-cooling steels (high carbon, high chromium) are specified for punch and die parts.

Much staking and riveting is done. If possible a ring stake is used, if space is available for assembly of other components. Ring staking is reliable, the metal is not compressed as much as by other methods, and metal flow can be controlled. For a roll-over stake, a drilled type rivet is preferred to a solid cold-headed rivet, because commercial tolerances on the latter are not always satisfactory for proper assembly of Greist products. Shouldered rivets are used to a large extent to assure a good fit.

Other considerations in die design will be discussed, largely in respect to a die for the guide piece of an edge stitcher:

Since each production run will amount to more than 50,000 to 100,000 pc, a progressive die is to be used. Steps in design were:

1. Calculate tons to blank
2. Lay out the scrap strip to determine:
   (a) Number of stations needed
   (b) Width of material
   (c) Lb per 1,000 pc
   (d) Best method to save material
   (e) Sequence of operations
   (f) Size of die
   (g) Size and type of press to use

If a job calls for 45 tons, the shop will use a 55- to 75-ton press to avoid springing the frame, and because the press safety factor may be small.

3. Choose an all-steel precision-type dieset. Make the die in sections wherever possible. Sink the sections into the die shoe; never depend on the dowel pins to absorb side thrust.

Bush the die where a round hole is to be pierced, because bushings are easily replaced. Bushing holes should be straight for ⅛ in., then tapered ¼° per side or counterbored to pass slugs freely.

Head or wedge small punches. For punches 5/32 in. and up—whether round, square or rectangular—insert a kicker pin backed up by a spring to break the oil seal and push down the slug.

To simplify regrinding, every attempt is made to design a die so that it need not be taken apart completely for regrinding. And the components are arranged so grinding straight through can be done. At forming stations, a hardened block is inserted, so that it can be ground. Hardened form blocks or punches will drop to compensate for grinding the die. Frequency of regrinding is the responsibility of the shop, but the normal preference is not more than 50,000 to 60,000 blanks per grind.

Most forming is done upward, not downward. While this is the more expensive method, Greist engineers believe that it gives better results.

#### EIGHT-STATION DIE

The scrap strip layout for the edge-stitcher guide revealed that eight operations are required, because the part involves making several forms. These operations are:

1. Stamp name. No further metal movement or distortion occurs if stamping is done first.
2. Pierce four slots and one hole plus two outboard pilot holes. Slots in the part are staggered to afford better strength in die sections.
3. Pierce three more slots and gut stock to aid forming later on.
4 & 5. More gutting to remove excess stock.
6. Form small tab.
7. Form an offset and form up the right-angle form.
8. Clip.

This is a large die, hence a 4-post die set is used to balance thrusts.

Further design pointers are:

**Small punches**—Instead of using turned punches (with shoulder for strength) in sizes from 0.035 to 0.0125 in., Greist buys drillrod blanks from 1½ to 3 in. long and ground to punch size. These are held in the punch plate with a half-round bushing with half-round "hole," or groove, and a taper wedge. The wedge, in turn, is prevented from falling out by using a large-head screw. If a punch breaks, it is a simple matter to replace one. They are never sharpened if broken and are replaced quickly.

**Stripper construction**—All round holes are bushed and bushings are a good slip fit with the punches. Square, rectangular and non-cylindrical punches are fitted to a hardened plate that is inserted in the stripper. No shake is permitted.

**Safety feature**—A stop at the back of the die is

provided, so that the tool is set to the correct height before starting the press.

**Sectionalized construction**—Steel straightedges form the boundary of the die member. These straightedges are tapered 5°, and when pulled down with screws, the die sections proper (also tapered) are firmly wedged in place.

**Pilots**—Shouldered and headed pilots are employed, so they can't pull out. Pilot holes or bushings have taper clearance to free a slug, if one is actually punched by the pilot (broken or missing piercing punch), so that a smashup will be avoided. Clearance is provided in the die shoe for all pilot holes, so dirt or small chips cannot fill a blind hole.

**Punches**—Odd-shaped and large punches are keyed into the punch plate, using a keyway in the plate and a flat on the punch.

**Strip lifter** — In progressive dies involving forms, Greist engineers like to use a strip lifter at about every third station. Spring-backed pins, in pairs, are used in upper and lower die members. Springs under the lower pins are just strong enough to lift the strip on the upstroke, and the lift is greater than the height of the deepest form. The springs behind the upper pins are stronger than the lower springs. Since the upper pins hit the strip before the punches, the material is pushed flat onto the die before any work takes place.

However, at the actual forming station in the above die, a spring pad is used.

## New screw-machine department

has nearly paid for itself since it was re-equipped 4 yr ago. Costs are down, production volume is up nearly 30%, because new equipment operates at modern speeds and feeds, camming is interchangeable instead of being limited in design to the slowest machine of a kind and size, and attachments can be applied to do second operations. Old equipment (and not so old by same standards) varied widely in capabilities, tending to let slow or old machines pace the entire department. Maintenance and setup costs are now much lower too. Investment consisted of 25 Brown & Sharpe's, two hand screw machines, and nine six-spindle automatics—two 9/16-in. Acme-Gridleys, three No. 60 and four No. 61 New Britain-Gridleys

## *Multi-spindle machines cut costs sharply*

## Foot for buttonhole attachment

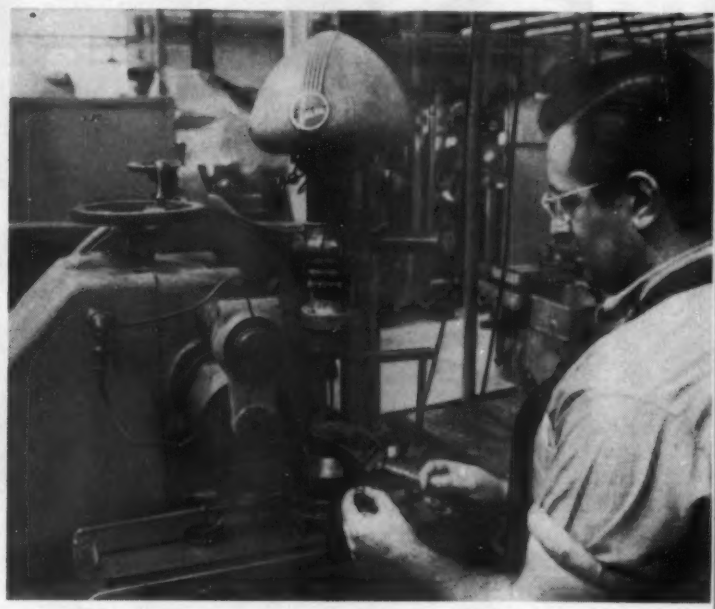
must have cross-grooved surface, somewhat like knurling. Formerly, this part was made in three batteries of two milling machines each, and production from the three batteries was only 1800 pc per day. Job was tedious and man-killing. Now, a Colonial broach performs both operations and turns out 350 pc per hr. Product finish is much better; the machine paid for itself in about 2 yr

## Buttonhole adapter

is turned out on a Kingsbury 20-in. automatic indexing machine at the rate of 700 pcs per hr. Machine replaced three drilling machines and will pay for itself in 4 yr. Operations performed are: drill 3 holes, countersink 3 holes and mill one face

## Two dial-type Globe tappers

paid for themselves in 2 yr or less. On one job, the cam hub, three 4-spindle drillpresses ran constantly to spot drill, drill, ream and tap the locking-screw hole. In contrast, the Globe tapper dial is loaded 2 pc at a time, produces up to 2000 pc per day, is needed only 3 to 4 days per week. A second Globe replaced 6 machines on the cam support. Multiple-spindle, easy-loading equipment is Greist's preference on production jobs



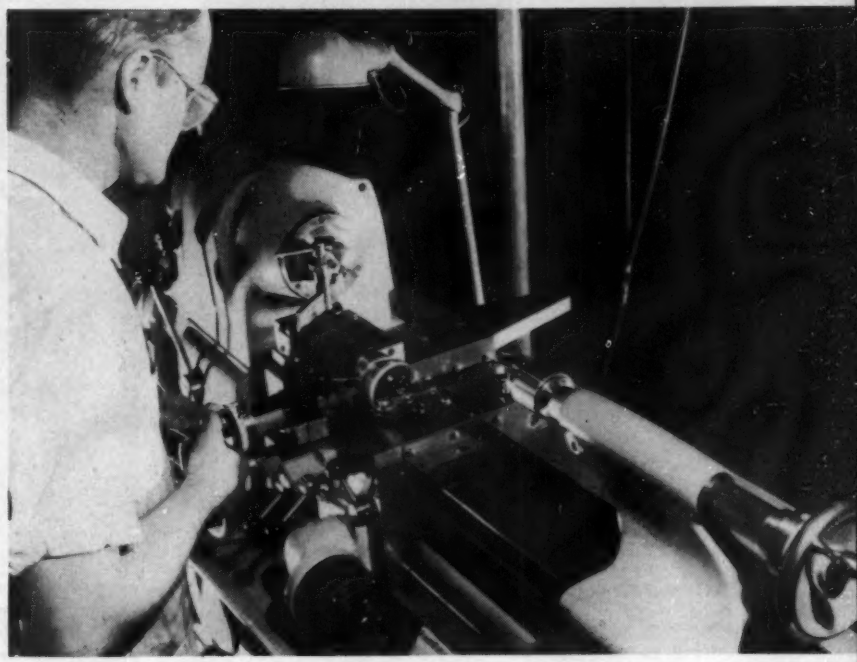
## Delta head

on US Multi-Miller does tapping at "no charge." Tripod mount for Polaroid camera has a short ¼ in.-20 tapped hole that must be a quality job—impossible to get in a blind hole in screw machine. So part, to be straddle milled anyway on Multi-Miller, is tapped by Delta head without unduly holding up the milling-machine's automatic cycle

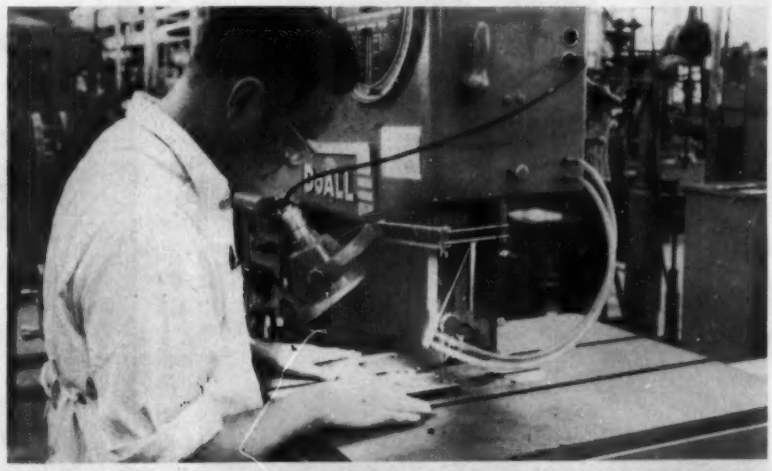
# *Modern toolroom backs up Greist production*

When a plant modernizes its operations and methods, it must be supported by an adequate toolroom. Greist doubled the size of its toolroom, as part of its over-all modernization program. Precision jig boring and jig grinding machines were installed, plus optical comparators, lathes, milling machines, etc. Many of the new machines paid for themselves in 2 to 3 yr.

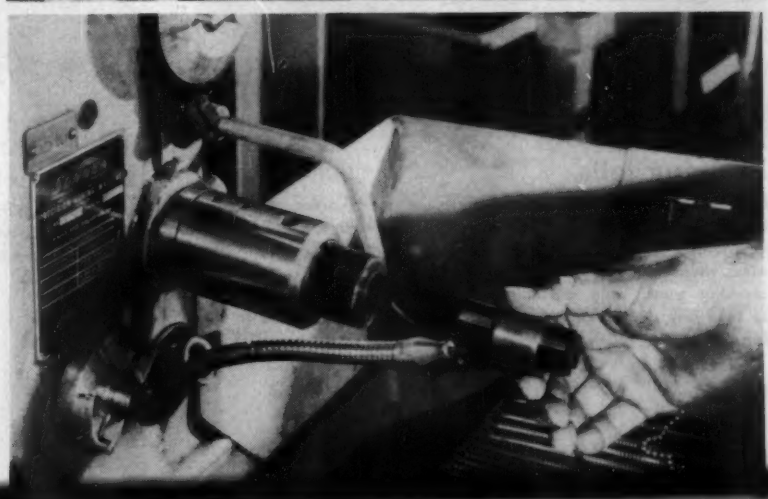
The Greist toolroom is expected to make only about 5% of progressive dies, compound dies, precise gages and fixtures used in the shop—in order to "keep its hand in." Other new tools are obtained from vendors. The toolroom's job is to check incoming tools, to repair and check tools and gages, and to work on special problems. Men in the toolroom, plus the apprentices, are expected to develop specialized knowledge and skills applicable to the Greist business. Thus, they can best play their part in the over-all development of skill that the management considers necessary for the company as a whole.



**Punches, special pins and threads**
are turned on a Hardinge "dovetail-bed" precision lathe, which is expected to pay for itself in 2 yr. Punches are made of air-hardening steel to avoid distortion. If the product-limit is 0.001 in. and the punch is to be held to 0.0005 in., it can be turned without need of grinding (lathe accuracy 0.0002 in.) and the normal 4 hr for making a punch (ground) is cut to 2 hr



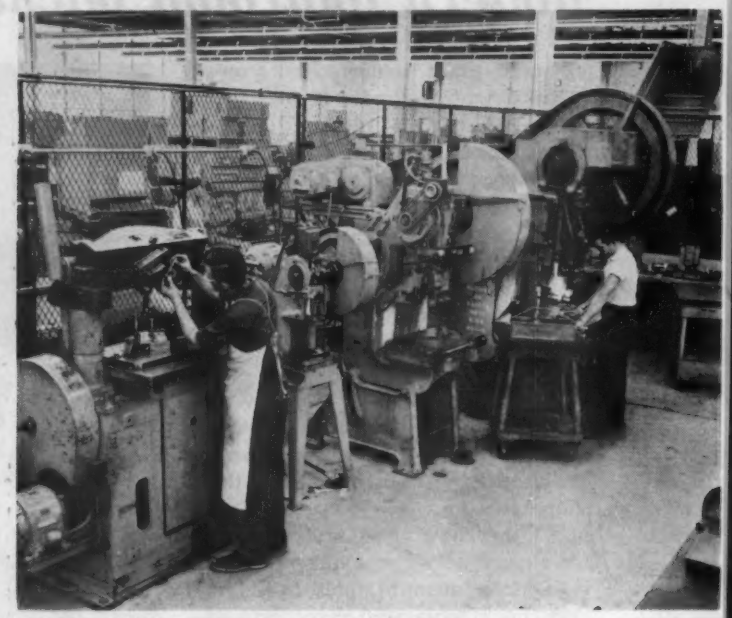

**Toolmakers' time**
is drastically saved by a DoAll contour saw, a machine that is estimated to save its cost in 2 yr. Internal cutouts can be made in die sections in ½ hr as compared to 8 hr; hardened material guides can be cut off by friction sawing, or notches cut in hardened strippers, in about the same time

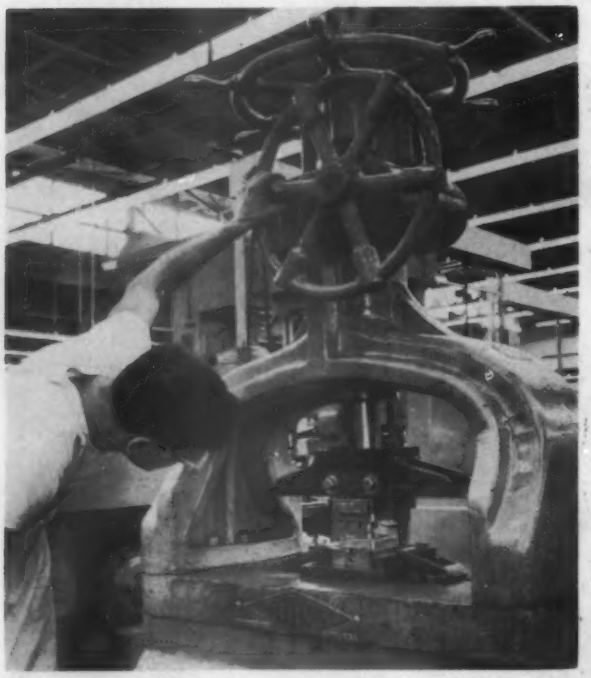


**Dowel-pin holes**
in die components and sleeves or die bushings are lapped to tenths in a few minutes on a Sunnen honing machine. By comparison, a hand lap takes about 2 hr to make, and the results are often inaccurate

## All dies are given a functional check

in the toolroom, regardless of whether new or repaired. Twelve parts are checked against drawing specifications. Before this setup was made, Greist had no way of knowing in advance whether functional parts could be made. The Alpha tryout press has a hinged ram that can be swung back so the diemaker can readily check punch or die details. The other three presses are used for running sample parts at delivery of a new die or after repair of an existing die, to avoid tieing up a production press





## Pressing jobs

are handled with a Producto back-geared screw press of 50 tons capacity. Here, the diemaker is sinking a hub into a soft die block in order to make a stamping die for the buttonholer cam. Other uses: shearing in punches, trying out progressive dies by hand, checking punch and die alignment. Shut height, 10 in.; width to take any die that can be used on shop. Estimated time to pay for press, 2 yr

## Demagnetizer

is big enough for entire die, to be sure that no part is still magnetized and parts or slugs will stick to it. Tote pans of magnetized parts or assemblies can be handled too. Device is considered one of most useful in toolroom

## *Assembly Kinks . . .*

**Magnet coil**

in riveting die simplifies making a multi-unit assembly. Dial-feed assembly is impractical here, because it cannot match the operator's output of 390 assemblies per hr. Four sub-assemblies, a special rivet and a washer are assembled here. Operator builds up the assembly by placing sub-assemblies on the rivet in Christmas-tree fashion. The magnetized die holds the rivet upringht while sub-assemblies are added. Finally, she heads the rivet with 15 in. motion of the kickpress treadle. For safety in assembly operations on bench presses, workers are trained to pick up a part with left hand, transfer part to right hand, place part in die with right hand, push press control with right hand, while left hand is reaching for a new part. A swinging guard is applied to all kickpresses and to all bench-type power presses

**Oil and some burrs**

are removed from blanked parts by tumbling with "Maizo" corn cob meal, so that they can be handled properly in secondary operations. The Baird No. 3D barrel takes a load of about 1000 pc. This type of barrel is used for rather large parts

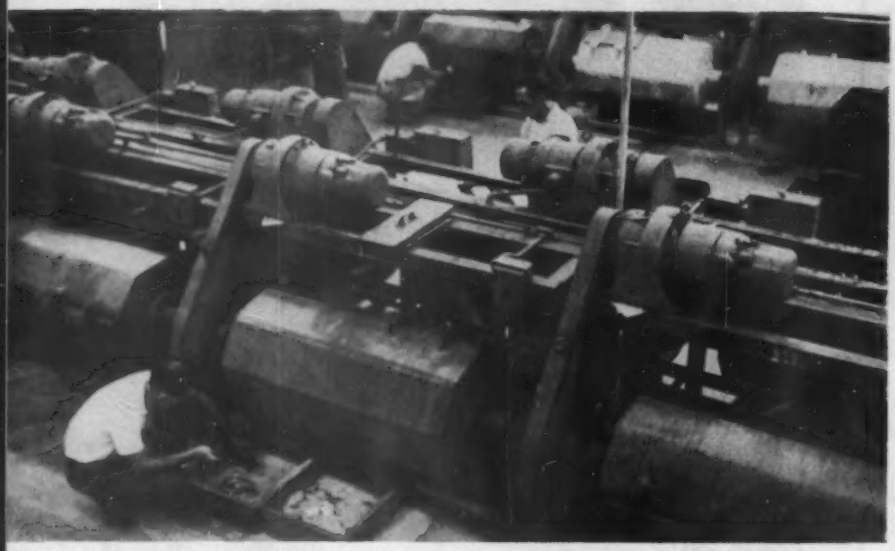
# *Finishing costs cut by improved methods*

Finishing departments at Greist parallel the fabricating and assembly areas, and are departmentalized so that only cross feeding occurs. Thus, minimum handling is required to perform the desired finishing operation and send it to the next fabricating or assembly operation.

Approximately 95% of Greist parts are tumbled. The process is used after blanking to remove any slight burrs and oil, before secondary operations are performed. The idea is to put the parts in the best condition for further handling and easy location in fixtures or dies. Another dry tumbling may be used after forming to round corners and remove burrs. Wet tumbling is performed to combine cutting down and coloring when pieces must be barrel nickel plated. Only 4 men now work at polishing jacks, whereas before the modernization program 40 men were so employed on one-tenth the production.

All interior parts of the Polaroid Highlander Land camera are phosphated before painting. Some Greist parts are black oxidized in a Leeds & Northrup furnace, and contract work is likewise done in this equipment.

In the painting department 27 operators who formerly hand dipped work in process have been replaced by two automatic spray painting and baking setups, each served by a single operator. Hand spraying in conventional spray booths is continued for Polaroid Highlander Land Camera cases, because two kinds of finishes are applied and masking is required.

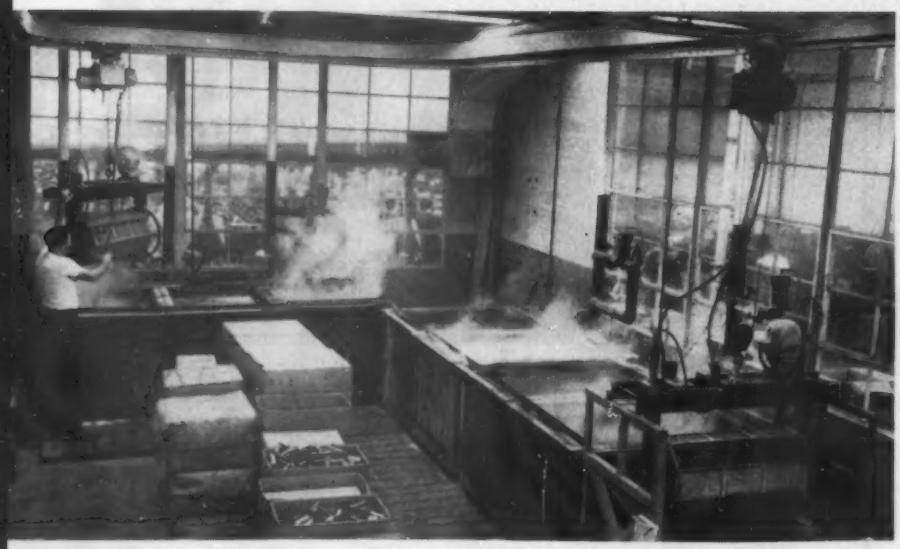


## Smaller parts

are tumbled (foreground) to remove oil in Greist-designed, chain-driven two-compartment rubber-lined tumbling barrels. Each 24 x 24- in. compartment takes two tote pans of parts—about 50 to 60 lb per pan—plus twice as much cob meal by volume. Usual tumbling time is 1 hr, at speed of 25 rpm, but fragile parts are tumbled for 10 to 15 min with 4:1 ratio of cob meal. Similar unlined barrels (background) are used after secondary forming operations. Here, the purpose is mainly corner rounding and burr removal, so to two pans of work per compartment, the operator adds one shovel of No. 0 pumice and two shovels of cob meal to soak up oil. Barrels are equipped with timers to stop barrel at any desired time between 2 and 6 hr. Parts, after separation in rotary sieve (left center), are ready for ball burnishing or other operations to produce bright finish

## Riddling

cob meal from work can be a back-breaking and time consuming operation, depending on equipment used. Greist got rid of hand riddles in favor of a tumbling barrel (right) fitted with a cone-like screen. But later it chose a Ransohoff gas-heated machine that separates the parts from the cob meal after burnishing, and heats the latter to drive off moisture. Reclaimed cob meal can thus be re-used 10 to 12 times. Labor-savings are such that the Ransohoff will pay for itself in one year. Parts are free of dirt and finger marks and require only minimum cleaning before plating. Another Ransohoff is making similar savings in drying work after nickel plating. Work has a better color and is free of brown stains, as compared to drying in an ordinary tumbling barrel



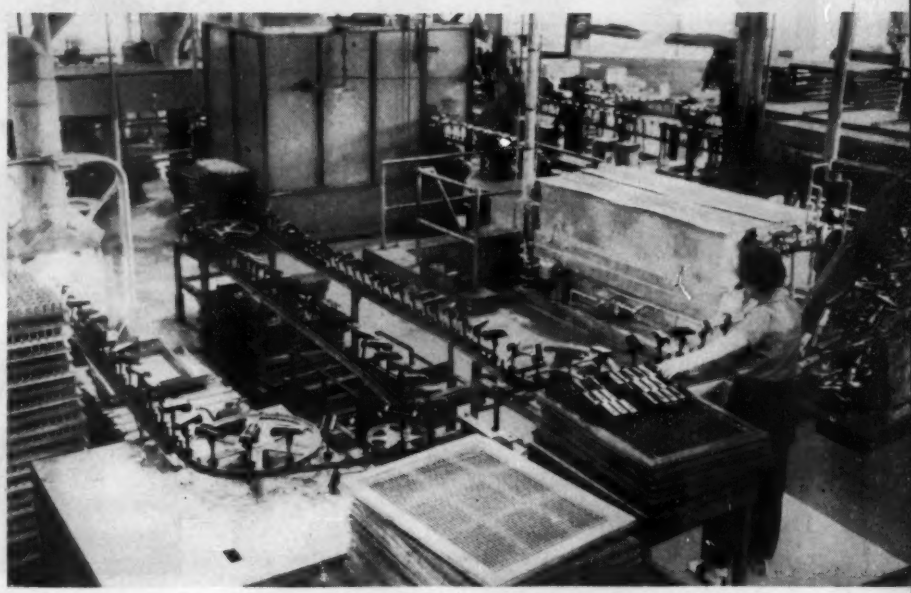
## Phosphate coating

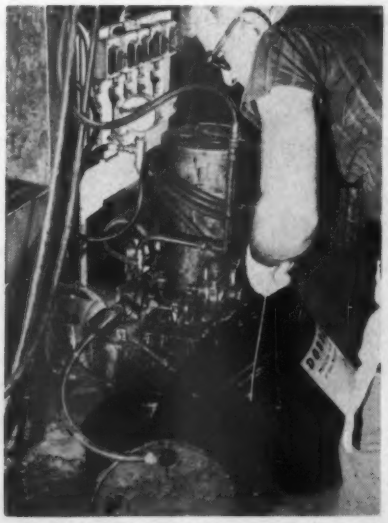
is used to protect all camera parts that will be painted. This 7-tank setup is served by two hoists and monorail, so that the operator can keep work moving properly. Outfit produces 150 lb of work per hr. Automatic temperature control holds tank temperatures within ±5F to maintain desired quality. This installation was used to clean and salvage work soaked in a recent flood, thereby leading to large savings and helping to get assembly operations going again much sooner

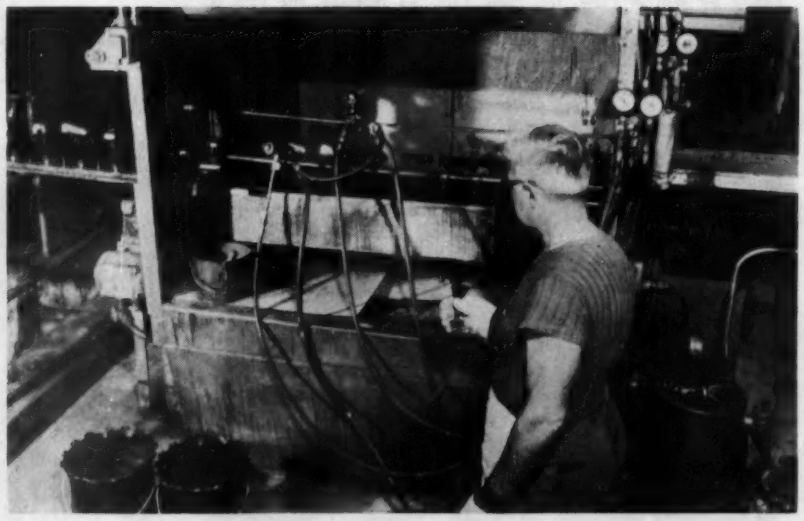
# *Modern painting layout cuts costs*

## Automatic spray

painting of any part that can be held from the *inside* is done on this setup at the rate of 1440 pc per hr. Work carriers, or spindles, incorporate a V-belt sheave so that they can be spun at the automatic spray booth. A simple sheet-metal "fixture" is screwed to the top of each spindle to receive and grip the work on the inside. Here, the operator removes a painted buttonholer case from the conveyor with her left hand and reloads the spindle with a new piece taken from the hopper with her right hand. Work goes through degreaser, an automatic spray booth, a dog-leg infra-red baking tunnel, and a cooling loop before removal at operator's station. Degreaser heats the work







## No interruptions

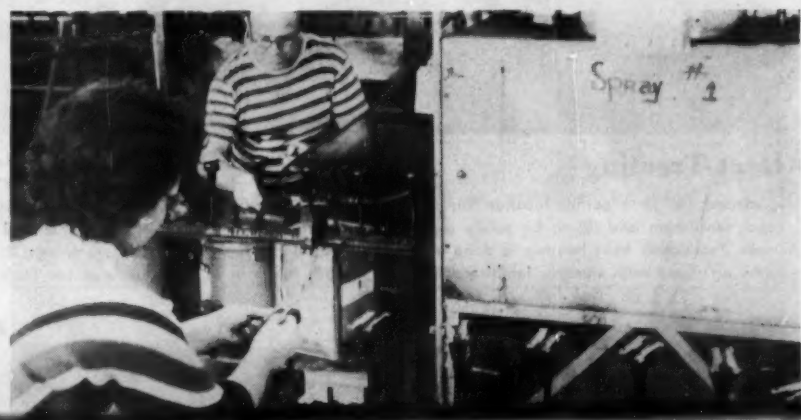
in production are required to replenish the paint supply, as would be the case if a pressure tank were used. Air-driven motor drives a pump through a gear reduction, and air is used to siphon paint out of bucket into the pumping system. To keep the system going, the setup man need only refill the bucket from another one. Paint is heated to 140 F, which permits putting on a thicker and more uniform coating, and which actually saves paint

## Buttonholer covers

are whirled by a double V-belt drive that makes friction contact with work-spindle V-belt sheaves as they progress through spray booth. Two spray guns are positioned to provide best coverage and are tripped by passing work. Fan in spray booth must be turned on before any other function can be started

## When parts can't be held

on the inside, they are laid onto a spindle incorporating a magnet. The magnet, of course, prevents the part from being thrown off, when the spindle is spun under the spray head. To protect magnet from paint, the spindle is capped with a throw-away tin-can cover, which has been indented by a round punch; thus, the contact between work and can is minimized to avoid marking. Production rate, 2000 pc per hr, two to a spindle

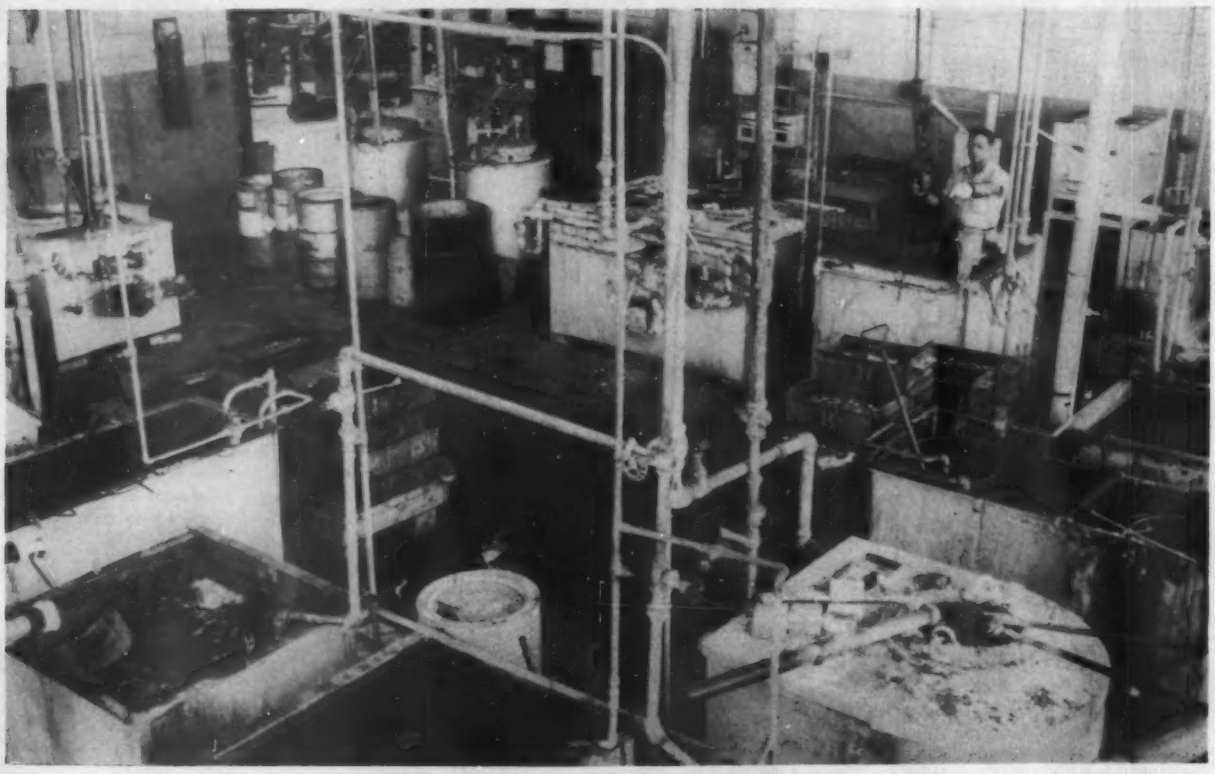


## Dull-black camera

paint is sprayed inside half of a Polaroid camera case, using a book-type mask. The mask parts are electroformed from a master part, then backed up with steel and assembled into a quick-opening fixture by Wm M Fiore, Inc, New York. As received, the case is highlighted along edges with chrome plating. Masking prevents overspray on the plated surfaces, and masks must be of high quality and tight fitting to avoid smears or wavy edges. To maintain a sharp outline, masks are cleaned after use with 6 parts

## Ends and sides

of Polaroid camera cases are sprayed with gray wrinkle lacquer. Two electroformed masks are required for these operations



## Heat Treating

is carried out in a corner location for two reasons: (1) to afford good ventilation and (2) to be safely removed from other working areas. Production heat heating is done in Holden gas-fired cyanide baths arranged with quench, inhibited pickle, and wash tanks in a hollow square. Men work around the outside of the square, served by monorail and hoist, for greater comfort, and any splashings or drainage is carried to a central floor drain. Equipment consists of 3 cyanide and one neutral salt furnace for screw-machine parts and stampings; 2 muffle furnaces for tools, and 2 Homo tempering furnaces for tools, springs, screwdriver blades and the like

# Round Table

## Working Through The Break

"You know that guy Barrett in my section, Ed? Boy, he almost started a good one today!"

"Why, Al? What did he do?"

"Well, morning coffee time rolls around, and everybody takes a break. But not this guy; he keeps working. Some of the other men really started to hop on him. I had to tell them to cut it out because he was getting steamed."

"Well, why didn't he take his break?"

"He said he was too busy. Can you beat that? Anyway, some of the guys weren't kidding. They were sore and they've been griping about it all day."

"You and I often work through the break, Al. Sometimes you have to."

"Sure, but we're part of management. This is different."

"Still, nobody *has* to take a break, Al. A man may have to work right through to get a load finished on time."

"Yeah, but Ed, the company says the break makes for better work. He probably would have gotten more done if he took the ten minutes out and relaxed a bit."

"Not necessarily. Look Al, the reason for the break in the shop is to give the men a booster. If one of them doesn't want it or need it, why should he have to take it?"

"OK, but how does it look for the other men? Everyone relaxes for a few minutes except one guy. He makes the rest of them look bad."

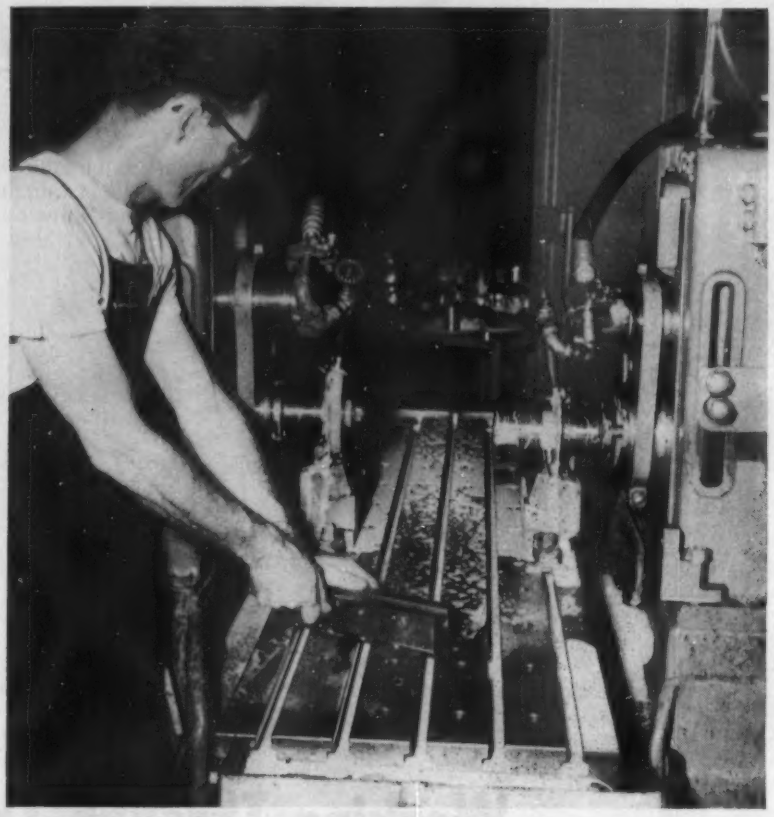
"Al, they have nothing to be embarrassed about. They're entitled to a morning break by company policy. Even if only one man decides to take advantage of it, he's still within his rights."

"Ed, the men don't see it that way. Beside, its easier for me to straighten out one man than the whole department."

"Suit yourself Al, but I think you're going about it the wrong way."

*Too busy for the coffee break? Is Al right in asking the man to conform? Your opinions can help others. Discussions of earlier topics start on page 258.*

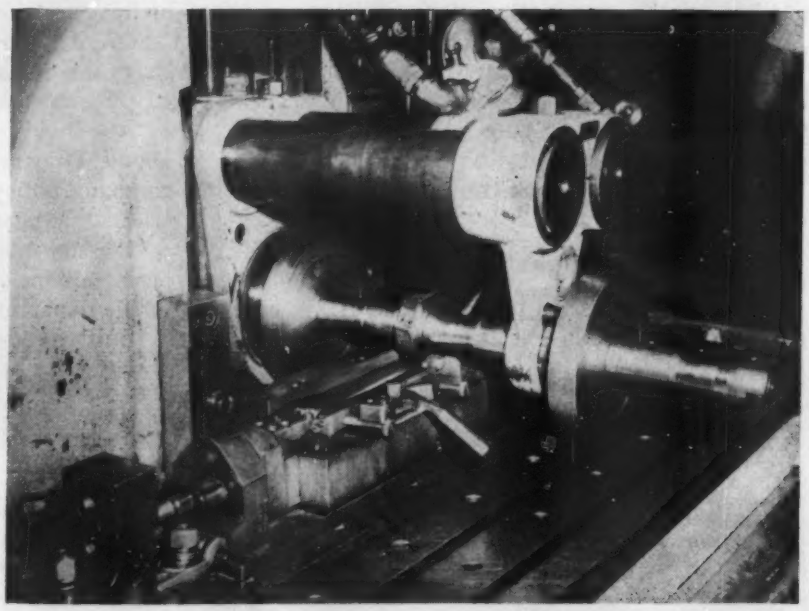
**BARS OF PURE MOLYBDENUM,** 9x⅝x1 in., were milled to a curved surface and a dovetail groove. Sides were tapered lengthwise and crowned with a ¼-in. radius. Groove width was held to 0.002-in. tolerance and depth to 0.004-in. tolerance. Finish requirements were 40 micro-in. or better



**DOVETAIL WAS MILLED** on a duplex machine with two fixtures. One side of the dovetail was cut in the first fixture, the other in the second. Thus it was possible to cut the groove with circular cutters. A completed dovetail resulted from each pass of the table

# How to form-mill molybdenum

ROY A TASSI, supervisor,
Mechanical Mfg Engrg,
and ROBERT EASTON, mfg engineer
WESTINGHOUSE ELECTRIC CORP,
SUNNYVALE, CALIF



**CAM-OPERATED,** trunnion-type fixture was designed to rotate the work during milling to form the necessary curved-plane surface. Arbor flywheels minimized cutter chatter

**Moly is abrasive and hard, so it requires rigid machines and fixtures, a flywheel on the arbor, cutter design like that for cast iron, a large number of teeth per cutter and the best carbides available. Chatter is obviously a problem**

The properties of pure molybdenum—hardness in the 200 Bhn range, abrasive characteristics greater than those of cast iron and a melting point at 4750F—make even simple milling of the material a problem. For more complicated milling, the problems grow in complexity.

In recent operations at Westinghouse Sunnyvale, a curved surface and a dovetail groove were milled in pure moly.

Although fixture design presented problems, the chief difficulty was in the design of milling cutters. Several grades of carbide were tried; most effective was the grade normally used for cutting cast iron (883).

Solid carbide end-mill dovetail cutters, with four flutes, were tried first. These needed sharpening after four passes (28 in. of lineal cutting), resulting in lost size. Circular cutters, 7 in. in dia, with 14 teeth, were found adequate. The large number of teeth proved practical because moly chips are no problem, forming much like those of cast iron.

Rake angle was held to 10° (radial) and relief angle was kept at 7° to maintain a good cutting edge. Side clearance was also 7°. A consistent chip load of 0.005 ipt was maintained.

Surface speeds of 200 sfpm gave maximum production between cutter grinds; best cutting speed was 250. Best cutter life was obtained with Royal Blue Cut, a water-soluble (10-1) coolant.

## What the Production Engineer Wants of Automation

*In speaking before the Production Engrg Div, ASME, comments on automation by N L Bean, asst to mgr, Automatic Transmission Plant, Ford Motor Co, Livonia, Mich, were:*

We believe that automation equipment should never be chosen merely for its own sake, but only because it can perform a given task better than any other type of equipment.

If the production engineer determines that the conditions are "'right" to use automation—and some of the considerations should be employee safety, inherent time lag of manual loading and unloading, quality control, and other factors—his assignment then is to secure or design automation to the extent that his selection of equipment will perform and produce to meet these requirements.

The first requisite for a machine tool that is completely automated is the production of a part to meet quality and print specifications. Other requirements would be that the machine operate without mechanical failure as close to 100% of the time as can be attained, and that the downtime from tool changes be minimized to the lowest possible degree, which is usually accomplished by having the tools standardized so they can be preset and changed easily and quickly. Safety, the saving of space, and ease in loading and unloading are some of the other prerequisites for the desired machine tool.

Keeping all these things in mind, the design engineer is expected to create a tool which takes advantage of the best locating points of the product to be machined and handles the part through subsequent operations, locating on points and performing machine operations in such a manner as to minimize accumulated errors.

Quality must be manufactured into and maintained in production. Any deviation from quality is a loss of profit, a loss of aim, and a loss of good will for any manufacturer. It is, therefore, extremely pertinent that quality and safety go hand in hand in making a marketable item. It can be readily recognized that the assembly of components can be consistently accomplished satisfactorily only when dimensions are uniformly maintained. This would mean that an attempt must be made to keep the range of tolerances closer than the range of limits established on the part prints. In the present era of mass production, assembly lines are automated to a great degree the same as in manufacturing processes, so random assembly can be accomplished only through the maintenance and standardization of dimensions.

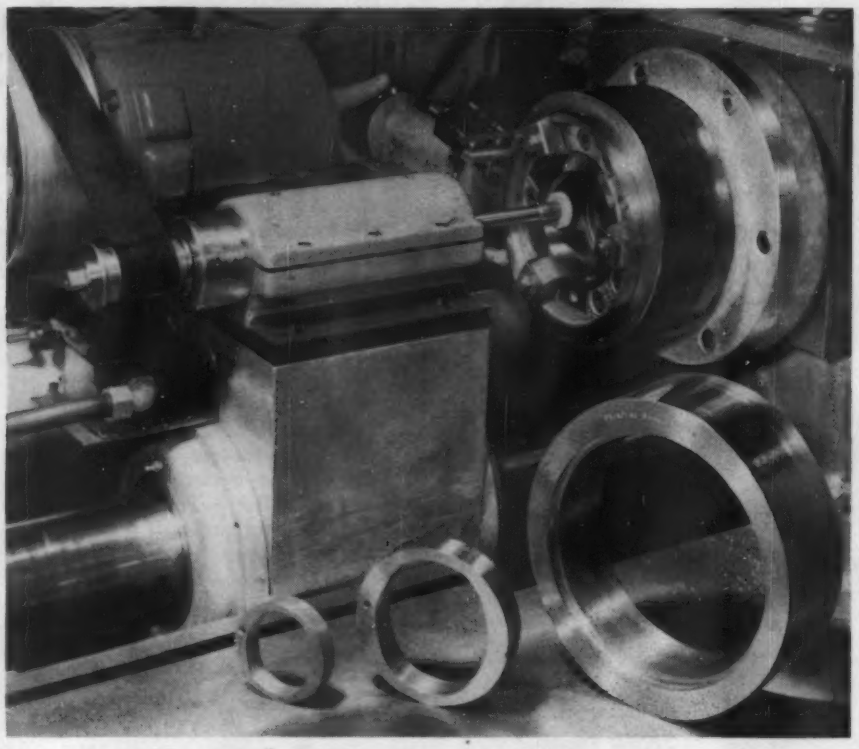
Ease of access to working parts in equipment plays a very important role in maintenance and repair when continuous operation means so much to an assembly line. All mechanical operations are subject to failures of one type or another, and correction of these failures in a very short time can be accomplished only when a repairman can determine the cause and make corrections quickly through simplicity of design and easy access to the offending failure.

The cutting tools of an automatic machine can play a very important role in keeping the unit in operation. Transfer machines have been perfected to a point where tool control is placed on a scientific level. Devices have been created which will detect dullness in a cutting tool, flashing lights before the operator to indicate the need for tool changes. In tooling these machines, one point to keep in mind is minimizing burrs or nicks that might occur through transferring from one station to another or by the drawback of a tool over a previously machined surface.

The production engineer expects a machine tool to have slides sufficiently long to guarantee flat or parallel machine surfaces.

Multiple-blade boring cutters or flat milling cutters should be installed on spindles which have been equipped with some type of torque control to indicate approaching dullness or breakage of the cutters. A warning light to the operator, indicating cutter dullness, will often eliminate cutter breakage, which often includes damage to machine spindles or other operating parts.

A properly designed and constructed machine tool which is completely automatic will repeat operations identically and in so doing, will reflect either good or bad tool setup. It is, therefore, necessary that inspection stations be provided between operations so that if and when a mechanical setting is incorrect, it can be detected immediately, before errors have been built into several parts. These gaging stations should be so controlled that unless the product meets quality specifications, it will not proceed to subsequent operations.



**GRINDING SETUP . . .** A speeder unit drives the grinding wheel as the slide oscillates. This movement is actuated by a stylus following the OD of a parabolic cam mounted on the spindle. The two part sizes are in left foreground, while the parabolic cam which actuates the carriage for both boring and grinding is in right foreground

# Automatic does contour

**Unique tooling setup (see front cover) finishes hydraulic-pump stator cam already bored on companion lathe. Speeder unit on front carriage drives wheel at 50,000 rpm**

Standard automatic lathes with special tooling perform difficult contour-boring and grinding operations on tough steel stator cams for Rotoblade hydraulic pumps at South Water Machinery Co, Rockford, Ill.

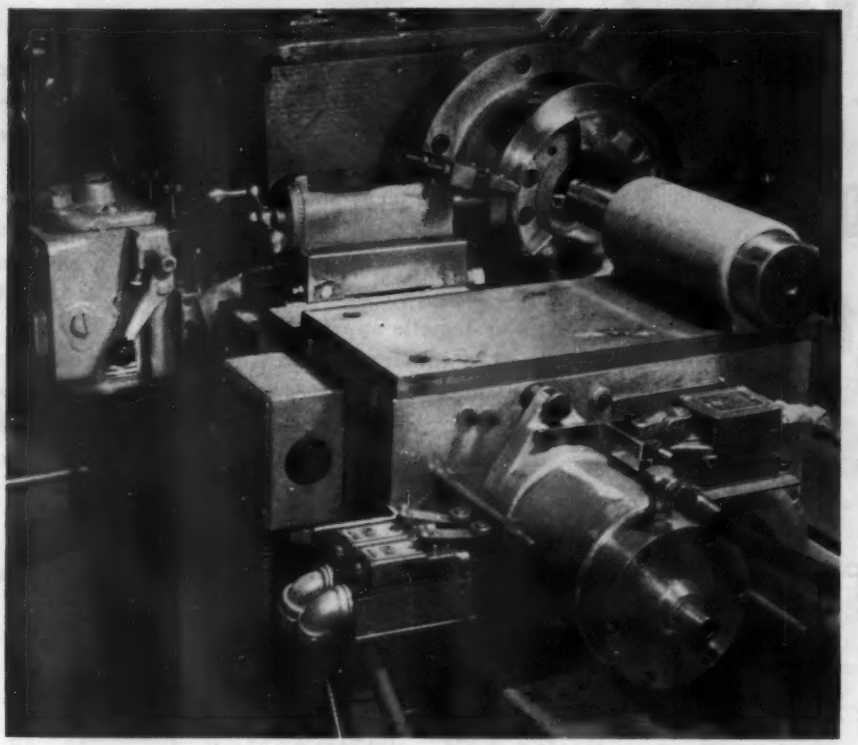
Tooling on both machines is similar, with finish boring performed on one machine while finish grinding is performed on the other. Each machine is a Gisholt No. 12 production lathe equipped with special, low-inertia front carriage mounted on anti-friction bearings and supported on the standard 4-in.-dia longitudinal feed bar. A special hydraulic elevating cylinder arrangement permits rapid oscillation of the carriage about the axis of the bar. This oscillation is controlled by a stylus which follows a parabolic cam on the machine spindle. The stylus is interconnected with a special front-carriage-slide top upon which may be mounted either a boring head or a grinding spindle and drive motor.

An adjustable-stroke hydraulically operated ratchet cylinder advances the boring tool or the grinding wheel into the work for successive automatic passes. This allows any even number of passes at the work, from a low of two to as many as 30 or 40 if necessary. After each pass, the ratchet cylinder advances (approximately ¼ in. on the boring machine and 1/32 in. on the grinding machine), moving the tool radially away from the center to the proper depth for the next cut. Finish dimension of the workpiece is determined during original setup, and when the final pass is complete, bringing the workpiece within tolerance, the boring tool or grinding wheel is automatically returned to starting position.

Two different sizes of cams are handled on this equipment. Work is held in a special, air-operated fixture, locating against the back face and clamping against the front face with drawback-type clamp fingers. On either workpiece size, the automatic cycle is:

1 . . Rapid advance toward headstock with stylus and cutter in retracted position.

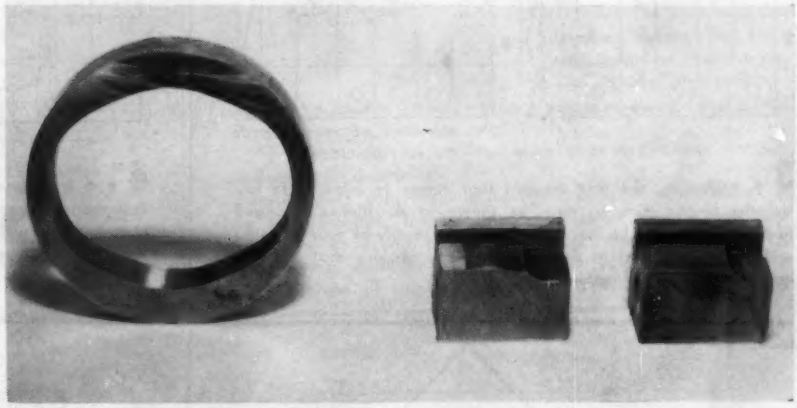
2 . . Stylus advanced to contact parabolic cam on spindle and tool moved radially away from center to proper depth for the first cut.



**BORING SETUP . . .** Stylus has engaged the OD of the parabolic cam, with a wiper just above to keep the cam surface clean. At the same time, the boring tool is in contact with the ID of the workpieces and is ready to begin another pass

# grinding

E SVENSON, president
JOHN S BARNES CORPORATION
ROCKFORD, ILL



**SET-OVER CAMS . . .** Finished workpiece at left is accompanied by set-over cam block for grinding (center) and for boring at right

**3** . . Entire carriage feeds longitudinally toward headstock for first cut.

**4** . . At the end of the longitudinal feeding cut, the tool clears the work, is again advanced towards the spindle centerline and the tool is moved away from the centerline for the next pass.

**5** . . Entire assembly then feeds longitudinally away from the headstock for the second automatic pass.

**6** . . At the end of longitudinal feed away from the headstock, the stylus is again advanced toward spindle centerline, the tool moved out to remove more stock and feed restored in the forward direction.

**7** . . Steps 3, 4, 5 and 6 are automatically repeated as many times as necessary to reach the predetermined full depth of cut. In cases where the part does not clean up, manual adjustment is available to provide additional stock removal. Upon completion of the last feeding stroke away from the headstock, automatic feed trip takes place, with the carriage rapid-traversing away from the headstock, the stylus retracted to clear the cam, and the cutting tool moved in toward the spindle centerline in readiness to repeat Step No. 1 on the next piece to be produced.

This cycle applies to both boring and finish grinding. For boring, the spindle rotates at 40 rpm. After boring, cams are heat-treated, then returned to the second lathe for finish grinding. During this operation, the machine spindle rotates to 40 rpm, with a special, motor-driven, speeder unit on the special front carriage driving the grinding wheel at 50,000 rpm.

14 steps TO DESIGN A DIE

PART 1...

# How to lay out a scrap strip

J R PAQUIN

**Capsulized step-by-step procedure for laying out a die was shown in a 6-page insert (AM—Oct 10, '55, p129). Now the author goes on to detail each step. The experienced designer uses these ideas and perhaps unconsciously selects from them the version that best suits the die he is designing. The less-experienced man can use this illustrated compendium to attain a systematic approach to his work.**

**The author's method is to show the procedure for designing a scrap strip for a particular part—from the first tentative tries to the finished layout. The same steps, applied for any similar part, should assure successful results**

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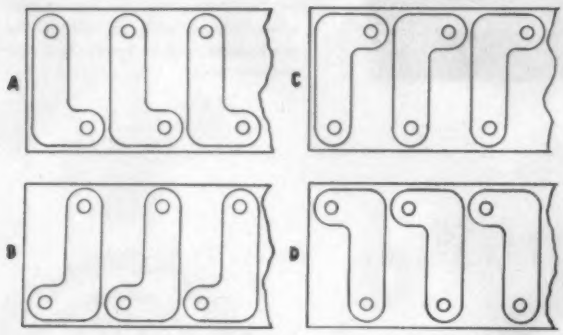
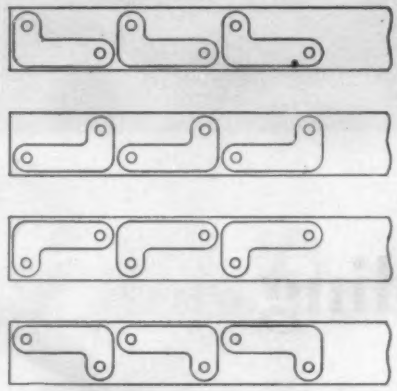
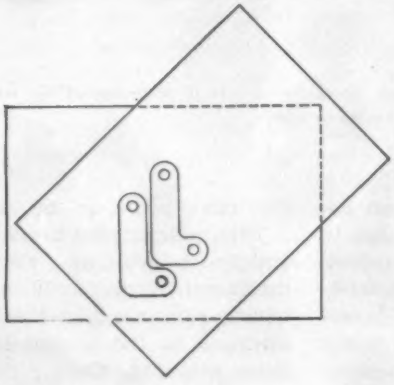


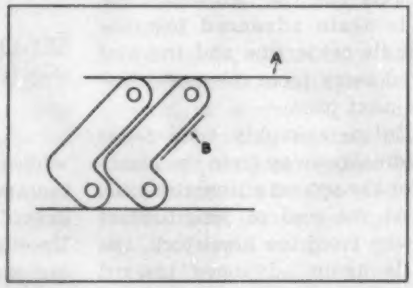

**3** • • Usually, the first thought that comes to mind is to lay out the blanks, side by side, as shown at *A*. Blanks arranged in this manner can be run through the die in any of four different ways, shown further at *B*, *C*, and *D*. It is obvious that this layout is wasteful of material



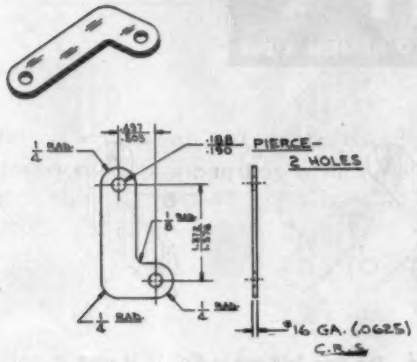
**4** • • If a bend is to be applied to the long arm of the part the first thought would be to lay it out the narrow way, as shown, because bends should be made across the grain. However, this layout is also wasteful of material. Again, it is possible to run the strip in four ways



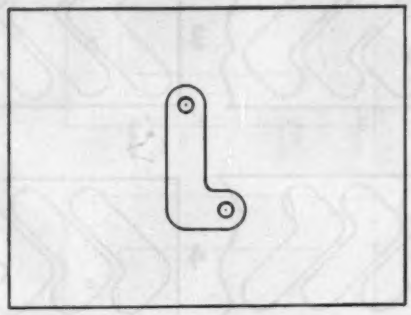
**7** • • Move the paper over the blank layout until the best nesting position is found. Shown above is the best nesting position for this part. Allow correct scrap-bridge allowances between blanks. See "How to Apply Scrap Strip Allowances to Blanking Dies," Paquin, (*AM*—Feb 6, '50, p86)



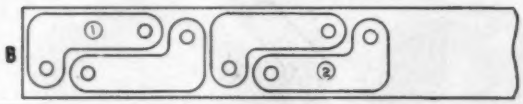

**8** • • Fasten this layout to the drafting table, straighten inaccurate lines, and check dimensions. Draw guide lines *A*, and leaving the correct scrap bridge allowance, part line *B* of the next blank to help in positioning the paper for tracing it

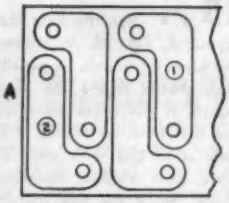



**1** • • A scrap strip is to be designed for the small, elbow-shaped part. Dimensional allowances are liberal enough so a progressive die can be used, instead of a compound die. In such dies the holes are pierced in a succeeding station

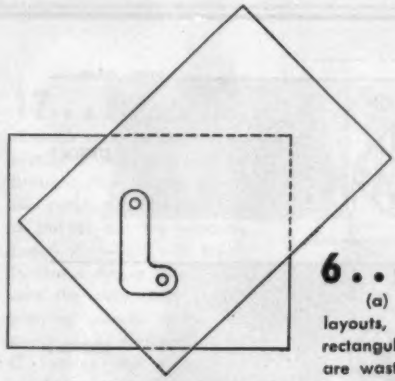


**2** • • The first step is to lay out the part accurately on paper. Check the dimensions carefully at this time, because any mistake will result in a great deal of useless work




**5** • • Double-row layouts are economical of material but lure the designer into trouble. At *A*, this part is shown in a wide-run, double-row layout. With No. 1 the blanking station, the strip would be run through, blanking all holes in the upper portion of the strip. It would then be reversed and run through the die a second time. Actually in running the strip for the first row, it becomes curved and distorted, and this can cause it to stick and bind when running the second time. Double die layouts, in which both No's 1 and 2 would be blanking stations, present fewer difficulties. A double-row, narrow-run layout is at *B*



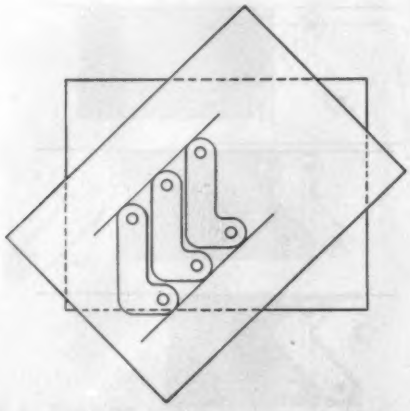
**6** • • To summarize:

(a) The side-by-side layouts, except for some rectangular or round parts, are wasteful of material.

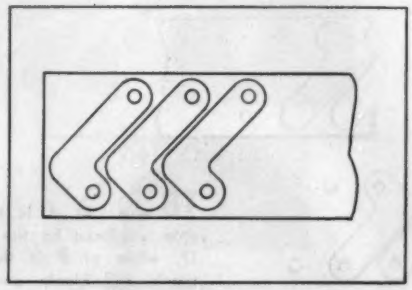
(b) Double-run layouts can be a source of trouble and should almost never be used for small parts.

(c) Double-die layouts are quite expensive except for extremely large quantities.

Most blanks with irregular contours will nest when placed in the right position. The best nesting position for the particular part must be found before proceeding with the strip layout. Here is the method: Over the part layout shown in Fig. 2 place a sheet of translucent paper and trace the part outline

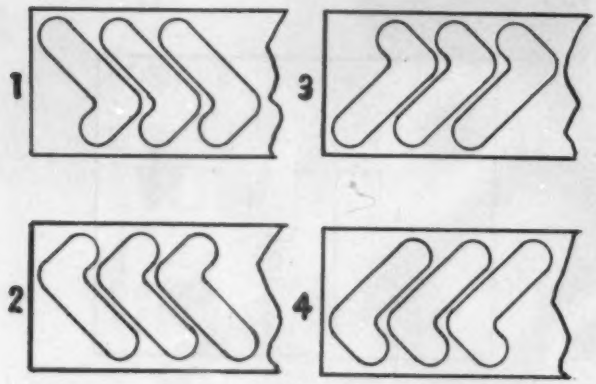


**9** • • Place the sheet back over the part layout shown in Fig 2, and draw the third blank as accurately as possible



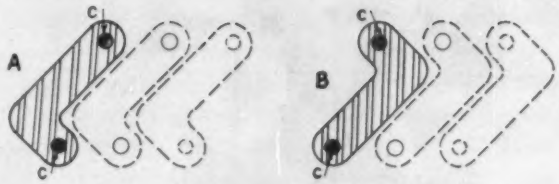
**10** • • The blank layout is now complete and accurate. It might appear that our task is finished but much work remains before we can be sure that we have the best possible layout. We must know that we have one that will perform satisfactorily

## How to lay out a scrap strip

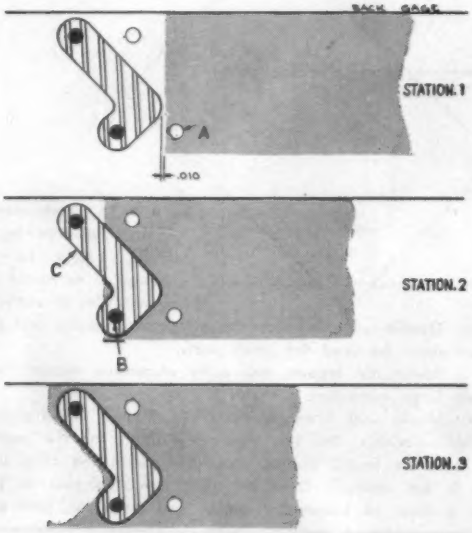



**11** • • There are four ways of running the strip through the die, using the layout just completed. Numbered 1, 2, 3, and 4, one of these will be the best method for a given part, depending on its contour in the layout shown in Fig. 10. From it, it is possible to trace directly for all four methods of running the strip, shown in Fig. 11

# 14 steps TO DESIGN A DIE

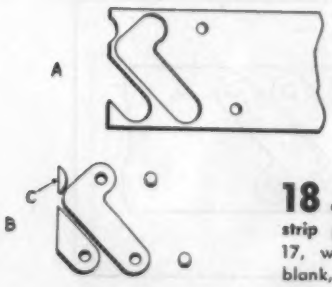



**12** • • The strip laid out in Fig. 10 is used in making piercing punch and blanking-punch layouts. At *A* is a layout which corresponds to method number 4, Fig. 11. At *B* the layout corresponds to method number 3. Piercing punches are usually drawn solid black (white here for convenience). Circles **C** are pilots in the blanking punch. These are usually drawn solid red. Note: For publishing convenience, solid black has been substituted for red. This view shows the importance of drawing three blanks

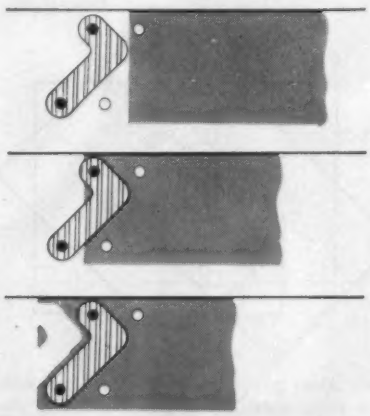



**15** • • Run the strip through the piercing and blanking punch layout *A*, Fig. 13. At station 1 the strip is advanced as close to the blanking punch as possible. In dimensioning the die, the finger stop should locate the strip 0.010 in. away from the blanking punch. If the press were tripped, piercing punch *A* would pierce the first hole. At station 2 the strip is advanced until the pierced hole is in line with pilot *B* of the blanking punch. If the press were now tripped, blanking punch **C** would produce a partial blank, while the two piercing punches would pierce holes in the strip. In our paper strip we duplicate these operations by tracing around the blanking punch and the piercing punches.

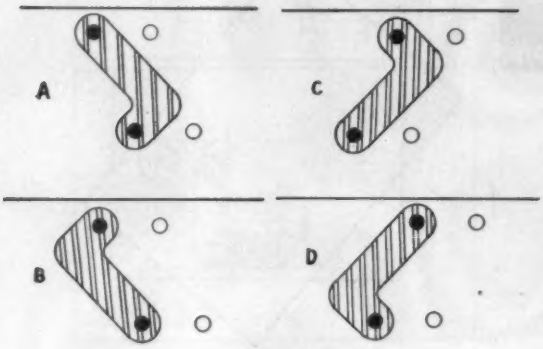
At station 3 the strip is advanced again until the pierced holes are in line with the pilots. Tripping the press would produce a complete blank, and two more pierced holes at station 1. Draw the outline of the blanking punch and the two holes on the paper strip



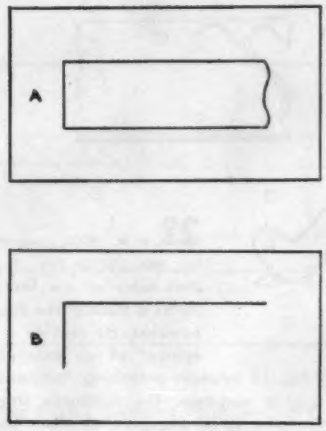

**18** • • At *A* is the scrap strip produced by the die, Fig. 17, while at *B* is the partial blank, full blank, and pierced slugs removed from it. No slug is left on top of the die block, but don't leave a partial slug as at **C**. Because the slug is not gripped securely in the die opening, it can cling to the blanking punch when the press ram goes up and then drop on die block. Also blanking punch makes a long, unsupported cut on one side. RULE NUMBER 2 is: Avoid cutting long, one-sided portions of a blank. RULE 3 is: Avoid cutting small portions of the strip not to be confined in the die block



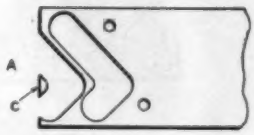
**19** • • This layout is opposite to the layout for Fig. 15, and the same rules and recommendations apply




**13** • • Four piercing punch and blanking punch layouts are traced from the layout in Fig. 10 to correspond to the four methods of running the strip. The line above each of these represents the front edge of the back gage

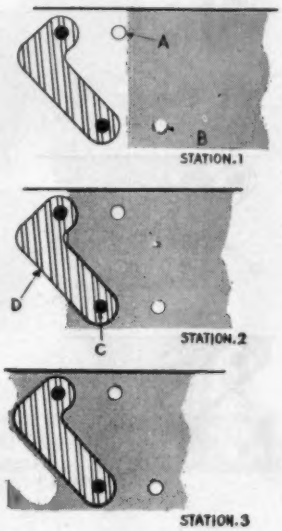


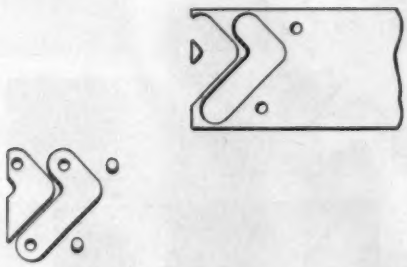

**14** • • On another sheet of thin paper draw the scrap strip as shown at *A*. For experienced men the two lines shown at *B* are sufficient for this tryout work



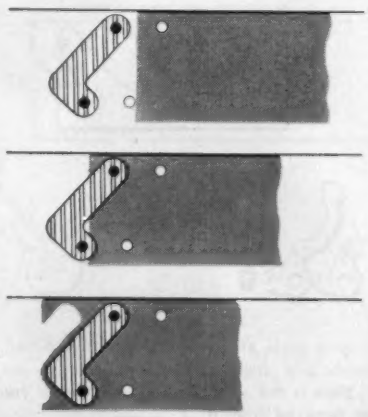
**16** • • Our scrap-strip layout now looks like the one at *A*, while the parts removed are shown at *B*. By analyzing this scrap strip, we see a serious fault. Tab *C*, cut at station 2, has remained on the die block where it can get under the blanking punch to chip it, or under the piercing punches to break them. This tab would be produced only at the beginning, and possibly at the end, of each strip, but many hundreds of strips will be run during the life of the die. RULE NUMBER 1: Arrange the first partial blank so an unattached piece of metal never remains on top of the die block

**17** • • Run a strip through view B, Fig. 13. At station 1, the strip can be brought close to the blanking punch, thereby creating a partial cut by piercing punch *A*, which will break it. Use a finger stop to locate the strip close to the piercing punch. Draw the punch *B*. At station 2, pilot *C* locates the strip and blanking punch *D* makes a partial cut. Draw the blanking-punch outline and the two piercing-punch circles. At station 3 a full blank is made. Draw the blanking punch and the two piercing-punch circles



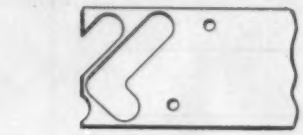

**20** • • This scrap strip is produced by the die in Fig. 19. While it does not seem to apply for this particular part, it would be the one to use for some parts with a different contour



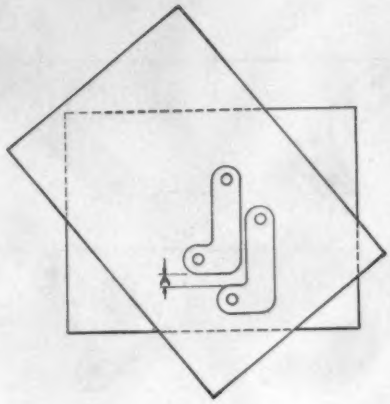
**21** • • This layout is opposite the layout for Fig. 17, and the same rules and recommendations apply

## How to lay out a scrap strip

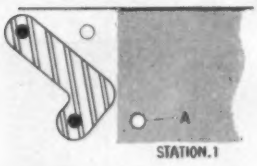
14 steps TO DESIGN A DIE

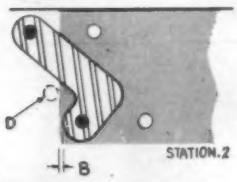


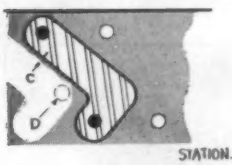
**22** • • This scrap strip is produced by the die in Fig. 21. It is obvious that none of the four methods produces a trouble-free die. These layouts, however, do provide a clue to development of an excellent scrap strip. The layout at Fig. 15 appears promising. Inclination of the part is good for gaging purposes. The automatic stop should push the strip against the back gage, rather than pull it forward. But we must find a way to keep tab *C* attached to the strip, possibly by changing the angle



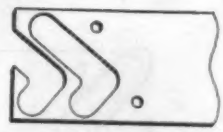

**23** • • Place another sheet of translucent paper over the layout in Fig. 2, turned over, and draw two blanks, leaving a greater distance *A* between them



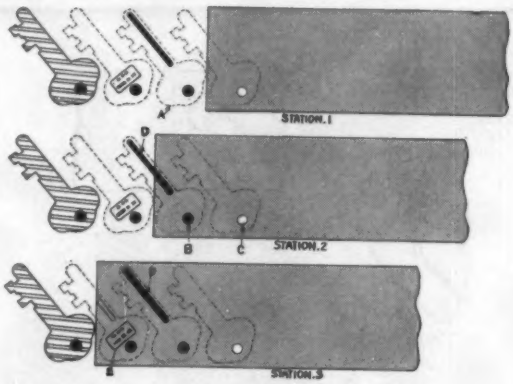




**26** • • At station 1, the strip is brought close to the blanking punch to get the maximum "bite." The altered angle creates a scrap bridge to hold the previously loose tab to the strip. Vary this angle until scrap bridge *B* is the same as the scrap bridge between blanks *C*. At station 3 a full blank is cut from the strip. Note that the toe of the automatic stop *D* is placed to stop the strip for the first blanking cut at station 2, and it also stops the strip for all succeeding cuts

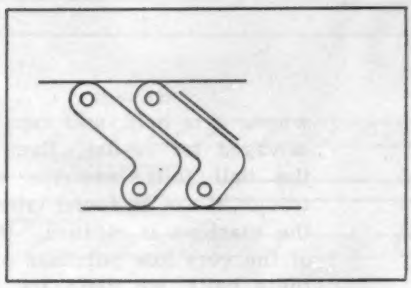


**27** • • This is how our completed scrap strip appears, along with the partial blank, full blank, and pierced slugs which were removed from it. Die design for this part can now be safely started with full knowledge that a good tool will result

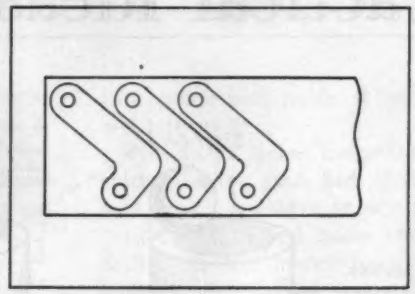
**29** • • Here is the scrap strip for the die in Fig. 28, as well as the parts removed from it



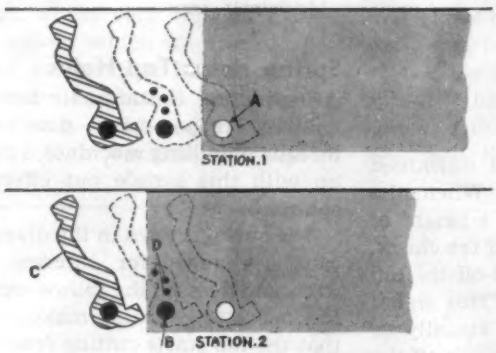

**30** • • This shows the scrap strip for a 5-station die. At station 1 the strip is advanced close to the dotted part *A*, and a hole is pierced. At station 2 the strip is located by pilot *B*, hole *C* is pierced, and embossing punch *D* applies a

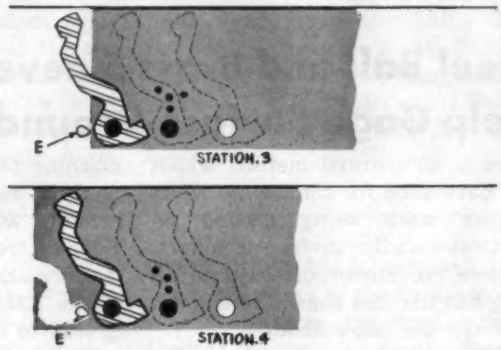


**24** • • Once again this layout is fastened to the drafting table and, using the protractor, we go over the outlines, straightening them accurately

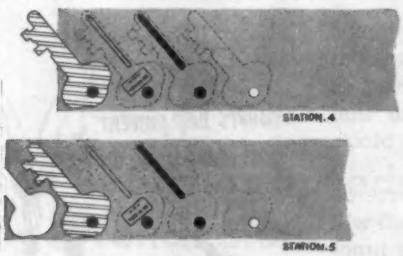


**25** • • After tracing the third blank we have a new layout with the part shown with a smaller angle to the horizontal than we had in Fig. 10. From this we make another piercing and blanking punch layout and run the strip through it

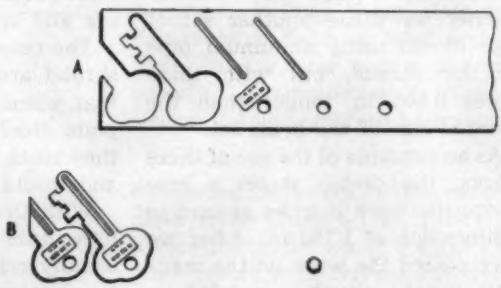



**28** • • Introduction of another station between the first piercing station and the blanking station does not alter any of the rules. Here is a 3-station die layout for a typical business-machine part. There is one difference. For dies having three or more stations it is wise to show the outline of the part at every station in either phantom or dotted lines. At view 4, the first full blank is produced at station 3, welding projections are applied at station 2, and a hole is pierced at station 1



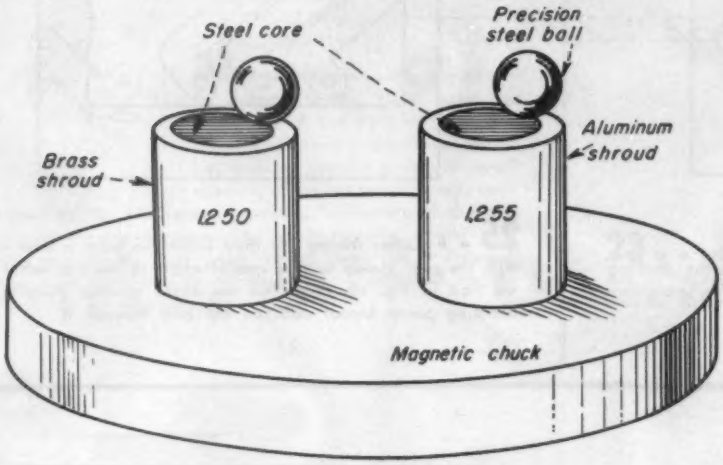

bead to a portion of the strip. At station 3 a marking punch *E* stamps the strip, embossing punch *D* applies a full bead to the strip at station 2, and at station 1 the strip is pierced. At station 4 the blanking punch cuts a partial blank, while members of the previous stations perform their functions. At 5 the blanking punch cuts a full blank




**31** • • At *A* is shown the complete scrap strip for this die, while at *B* the partial blank, finished blank, and pierced slugs are shown

***This series will be continued in an early number***

# Practical Ideas . . .




## Steel Ball and Brass Sleeve Help Gage Surface-Ground Work

Here is an unusual method which we have used for some time when gaging work being ground on vertical-spindle surface grinders. (There are numerous ways to do this, but the idea shown here is the best one we know about.)

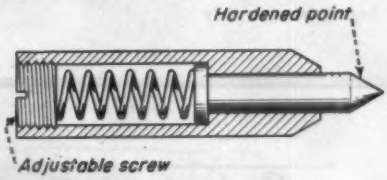
The method we use is this: We inserted round steel rods into brass pipe, and sliced this material into a series of pieces with dimensions graduated by 1/16 in. from 1/4 to 2 in. We then surface ground the length of this composite cylinder very accurately and stamped the height reading on the outside with metal letter stamps. In a similar manner we made another set of gage blocks using aluminum pipe for the shroud, but with these pieces 0.005 in. longer than the nominal size of the brass set.

As an example of the use of these blocks, the sketch shows a case where the work is to be ground to a dimension of 1.750 in. After we have placed the work on the magnetic chuck, we place a 1.250-in. finished-size block and a 1.255-in. aluminum-shrouded block on the magnetic chuck anywhere between the work pieces. On top of each block we place a 0.500-in. hardened steel ball. We then set the machine for the fastest downfeed possible for the job. When the grinding wheel reaches a height of 1.755 in. from the face of the chuck, it throws the ½-in. ball off the top of the 1.255-in. block. This signal is easy to catch, either visually or by hearing the ball bouncing off the guard of the machine. At this time we cut out the automatic feed and either put the machine on a slower downfeed or complete downfeed by hand, if the tolerance requires a slower approach. At the last stage of grinding, the wheel throws the ball off the top of the 1.250-in. block, at which time we stop feeding and spark out.

The reason for the non-magnetic shroud around the steel blocks is that when the balls were tried on plain steel blocks, we found that they stuck to the side of the block, and would not ride on top.

With the non-magnetic material around the block, the steel ball will usually ride centered on the junction between steel and brass.

With the "ball on block" method, it is very easy to see whether the ball is on top of the size block. For each load of parts the ball gets one or two small scratches, and it usually bounces back onto the chuck, where it is held, and can be resalvaged for re-use. Even when the ball falls into the coolant trough, it can be found later when the machine is cleaned. Because of the very low purchase price of these balls, we don't try to use each one for too long. *John Kapinos, East Longmeadow, Mass*

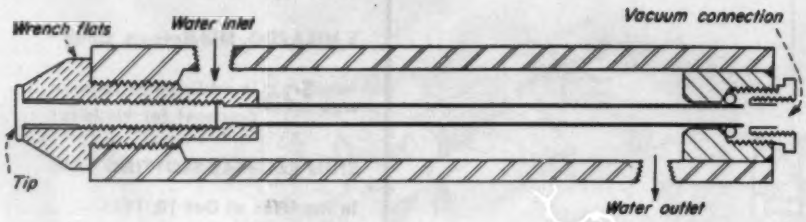



### Spring Helps Tap Holes

After having considerable trouble holding tapped-hole sizes and threads in milling machines, I came up with this simple but effective solution:

The spring shown in the diagram can be changed for different tap sizes, and does all the follow-up for the operator. It also makes sure that the tap starts cutting from the start. The operator is, therefore, relieved from "feel" in tapping with a solid center.

Not a production tool, this device has nevertheless been very useful in our job shop and toolroom. It has been used in a heavy miller where an odd hole had to be tapped, and on lighter machines as well. *David Derber, Oshkosh Wis*




## Vacuum Line On Projection Tip Aids Holding Bolts for Welding

Shown here is a special electrode for projection-welding bolts and similar work, which I designed recently. We have found that this design works very well on a 100-kva welder which we use.

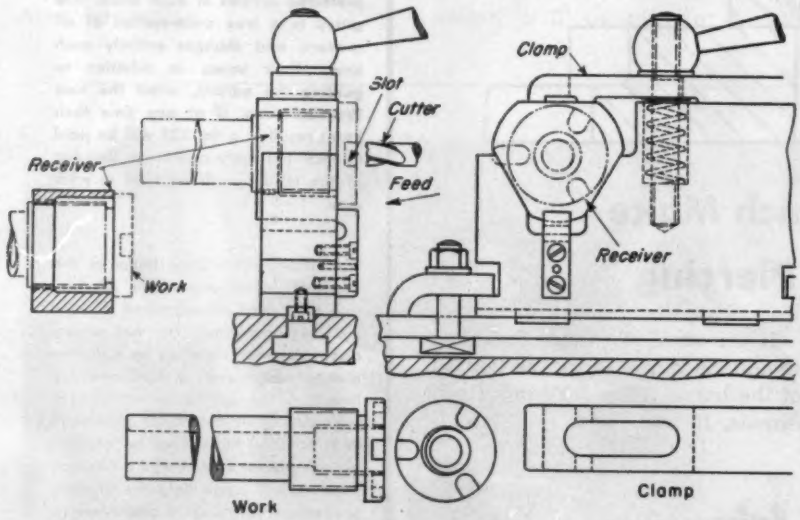
The outstanding feature of this electrode is that it requires no spring clip or any such device on the electrode itself to hold a projection-weld bolt or similar part in the head while positioning the work to which the part will be welded in a fixture below.

We have connected a small vacuum pump to the fitting at the top of the electrode, as shown. The operator barely inserts the weld bolt into the electrode at the bottom, and the suction pulls it up into place and holds it until the weld is made.

The water jacket keeps the electrode housing cool, but, if the design which we have shown proves inadeqaute, added holes could be drilled in the lower part of the housing, to increase water flow in that area.

When the electrode tip gets worn or burned, it can be removed or machined off to a smooth finish again, or it can be replaced with another tip, if it is too far worn to be useful after regrinding.

The other ways I have seen for doing the same job as this holder have used mechanical clips or holders to grasp the bolt. Our method has proven a satisfactory substitute for these mechanical holders. *G E Spangler, Tool Engineer, Ed Friedrich, Inc, San Antonio, Texas*




## Work In Receivers Speeds Milling Wrench Slots

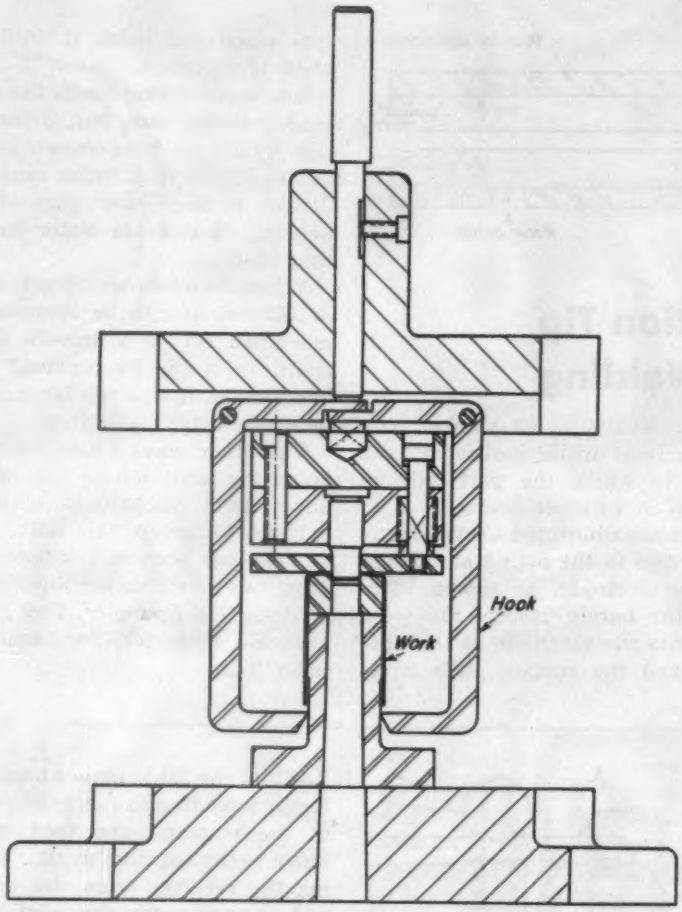
Milling the 3 wrench slots in the shell bar shown here looked like a hard job for us, because of a high required daily output. So, we had to work out a quick method for doing the job.

Simple jigs, each with two receivers, were made. The work is screwed into the receiver until the flange touches the end face of the holder. Then the work and receiver are put into the 60° slot of the jig, pushed against the stop, and clamped in place.

While the table moves back and forth, according to the fixed stroke of the machine, the feed works down to the required depth. Turning the receiver from slot to slot and changing for the next piece are done very quickly. In both cases the machine need not be stopped.

One girl easily worked three machines doing this work. Of course, the next workpiece is screwed into the receiver while the machine is running. Milling these slots by means of a dividing head would have been a slow and expensive process. *Ernest Schmidt, Keithstrasse, (American Zone) Germany*

**Removing splinters with emery cloth** (*AM*—June 6, '55, p168) is a very ingenious idea. We get the same result with ferrous splinters by holding the hand, in which the splinter has become imbedded, over the top of an energized magnetic chuck. This method is very painless, and has never failed in our shop. *H J Gerber, Stillwater, Okla*




## Pivoted Hooks on Punch Make Stripping Device For Piercing

When piercing shells in the bottom of a drawn or extruded shell, the work is usually located over a close-fitting horn, as shown here. The problem with this kind of operation is removing the shell from the horn after piercing. The kind of stripping devices shown above picks the shell off the horn during the upward stroke of the press, and, by means of a positive knockout, releases it after the stroke has hit the top of its motion.

During the down-stroke, a spring pressing up at the point of overlap of the hooks forces them inward at the bottom. The angles on the hooks permit them to slide over the part easily.

If the shell is round, the hooks should be made to fit the contour of the horn. *Allan I Young, Cedar Rapids, Iowa*

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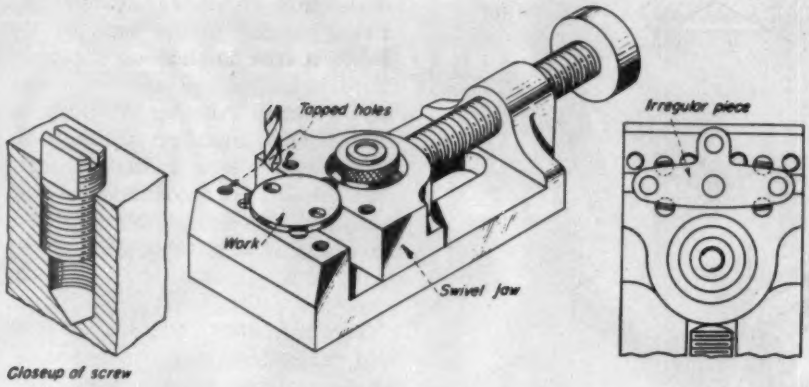



## Flatted Screws Aid Drilling Of Irregular Workpieces

Holding irregular-shaped pieces made from thin plate, when drilling in a drillpress vise, usually requires parallel strips or some such device to support the work from below against the pressure of the drill. When the parts are irregular or circular, obtaining a firm grip with the vise jaws is almost impossible.

Because many drillpress vises are made from cast iron, without hard inserts on the jaws, they are particularly suitable for modification for holding this kind of work. The change consists of drilling and tapping a line of holes in the top of each vise jaw. It is a good idea to drill as many holes as the jaw length will permit, to get the most usefulness from the holding method.

Headless screws are fitted into the tapped holes. The nicked ends of the screws are filed to form a lug with parallel sides. The flattened portion of each screw projects above the top surface of the jaw and acts as a small gripping face when in contact with the edge of the work.

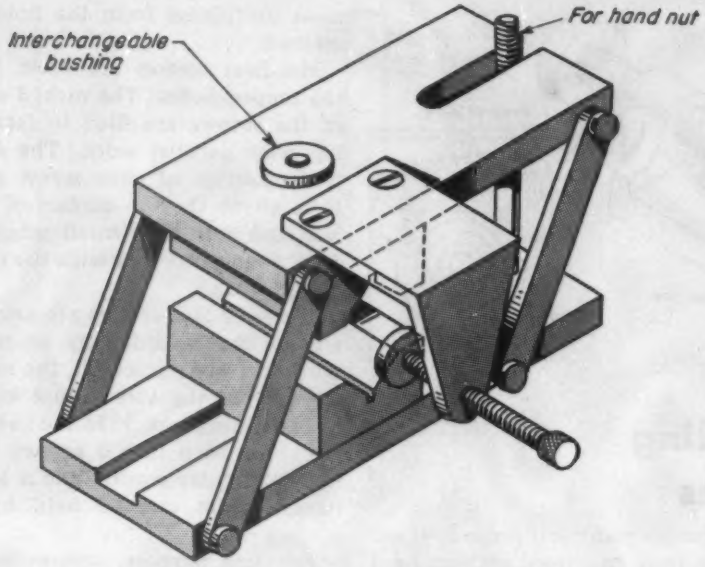
Three or four screws are usually enough for holding any piece of work. (To be successful, the moving jaw of the vise should be of the swiveling type.) In the sketch, it can be seen that 3 screws will hold a circular washer and a long, narrow part can be held by 4 screws.

For this purpose, screws work better than solid pins, because they will stay at a pre-set height level above the vise jaws, and are self-aligning to suit the work edges. If the holes are deeply tapped and counterbored, the screws can be completely housed when not in use. *Clifford T Bower, London, England*

## Hardened Drillrod Makes Simple Templet Scraper

We use the simple device shown here for accurately scraping the edges of small templets, shedder plates, gages, and similar work. The tool is easily made. Select a piece of carbon-steel drill rod which will fit the hole of the swivel plate of an ordinary surface gage (usually 5/16-in. diameter). Forge the end of the rod flat and heat treat to 62-64 $R_c$. Then carefully grind the end so the cutting edge is perfectly straight. Cutting characteristics are then similar to an ordinary hand scraper.

When assembled into the surface gage base, the scraper edge is squared up with the surface plate and locked securely in place. Use is simple. The scraper, held on the surface plate base, is moved around the work which has been clamped on parallels on the plate. By exerting light pressure against the edge of the work, it is possible to finish very accurately to a scribed layout line. I believe this method is preferable to hand or machine-filing, which I use to rough cut the form before using the scraper described here. *H J Gerber, Stillwater, Okla*




## Center-Drilling Fixture Adjusts For Length and Diameter

During the last war we were given a job which required drilling ¼-in. holes through the center of shafts 4 in. long, the holes being at a distance which varied from 1⅛ in. to 1⅜ in. from each end of the shafts. The diameters of the work varied from 1 to 1¼ in., and there were 100 pieces in the job, which was not to be repeated.

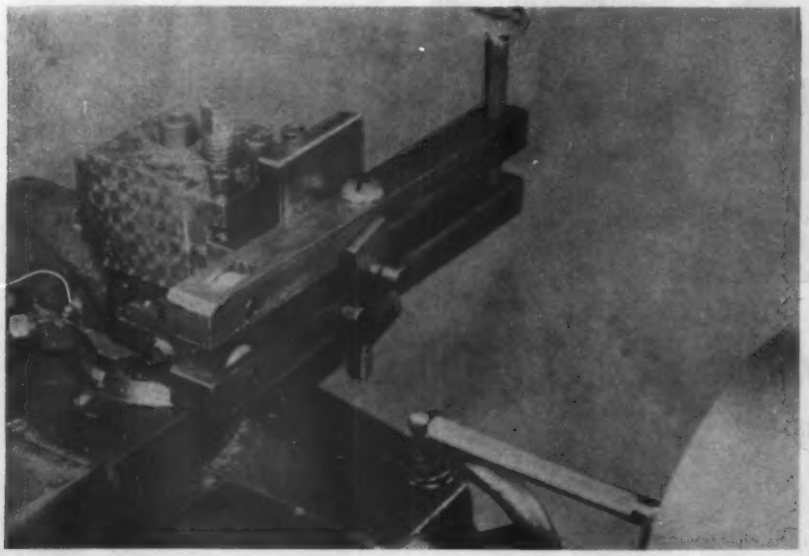
To avoid making a separate jig for each work size and hole location, we built the tool shown here. I have never seen one quite like it, even though this kind of work crops up very frequently in most job shops.

The jig consists of a base plate, top plate, links, bushing, and V-blocks, together with fasteners. The top plate is connected to the base by 4 links which swivel on studs, and therefore always remains parallel to the base. A V-block is free to slide on the base plate, being located in a tenon slot in the base. Another V-block is bolted and dowelled to the top plate, with a hole drilled through this block to accommodate the bushing. The end plate provides a stop, and is adjustable for length, being locked in position by a lock nut (not shown).

The four links should be drilled and reamed together, to maintain an accurate center distance.

The advantages of this jig are: Short bars of varying diameters may be drilled. End distance may be varied. The jig is easily and cheaply made. Operation of the jig is easy, only one clamp screw and hand nut being manipulated. There are no traps for chips to accumulate.

It is a good idea to provide against misplacement of the bottom V-block when the jig is not in use, because this block is not normally fastened in place (being free to ride to whatever position is needed). One suggestion for this is to drill and tap a ⅜-in. hole in the bottom V-block, and drill and tap a ⅜-in. hole in the base, so the two parts could be bolted together when put away. *H Bolton, Grantham, England*



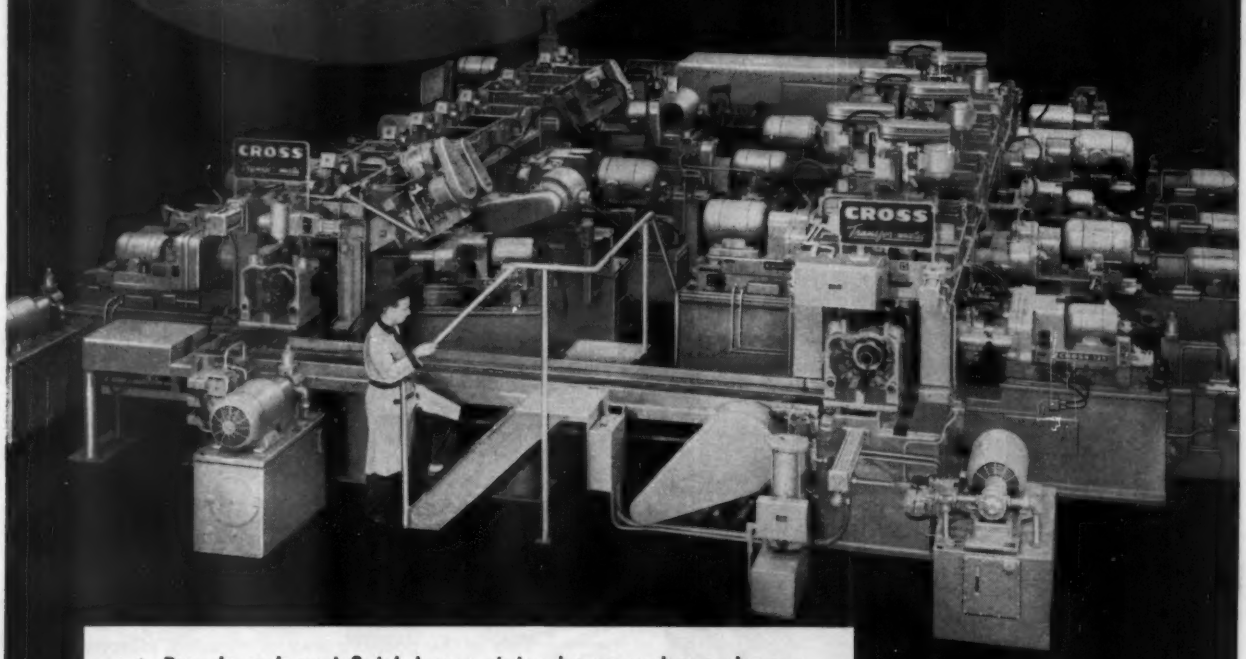
## Independent Knurling Tools Save Machine Wear

Knurling tools should be mounted independently to save wear on the headstock and cross-slide screw. By mounting the wheels on the business end of parallel clamps, as shown, this result can be gotten. The clamps are positioned by using proper holes in a T-block, and clamped in the lathe.

After positioning float, tighten clamping screws until the knurls are pressured to depth by the back screw of the parallel clamp. Then tighten the clamping screws for duplicate work. *Robert J Lemp, Sayville, NY*

# Mills, Drills, Bores, Turns Differential Gear Carriers

*Another Transfer-matic by Cross*




- ★ Rough and semi-finish bores pinion bores and cross bores; rough and finish faces and turns pilot diameter of torque tube flange; mills faces of cross bore bosses; spotfaces flange mounting holes; drills, chamfers, reams and taps all other holes except flange holes.
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- ★ 73 operations: 8 milling, 8 boring, 2 crossfacing, 1 turning, 18 drilling, 10 spotfacing, 7 chamfering, 2 reaming, 9 tapping, 8 probing.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Palletized work holding fixtures with hydraulically operated torque wrenches for clamping and unclamping parts.
- ★ Washing and drying unit for cleaning fixtures between last cutting station and loading station.
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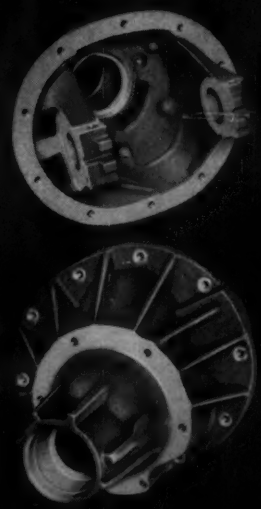

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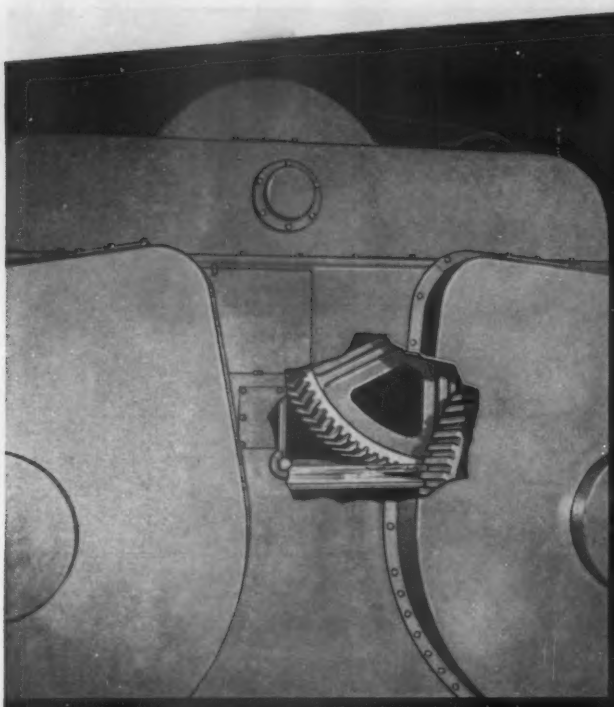

Cutaway showing how herringbone intermediate gears operate in oil bath within the crown.

Cutaway showing Verson main gears and the oil bath in which they operate.

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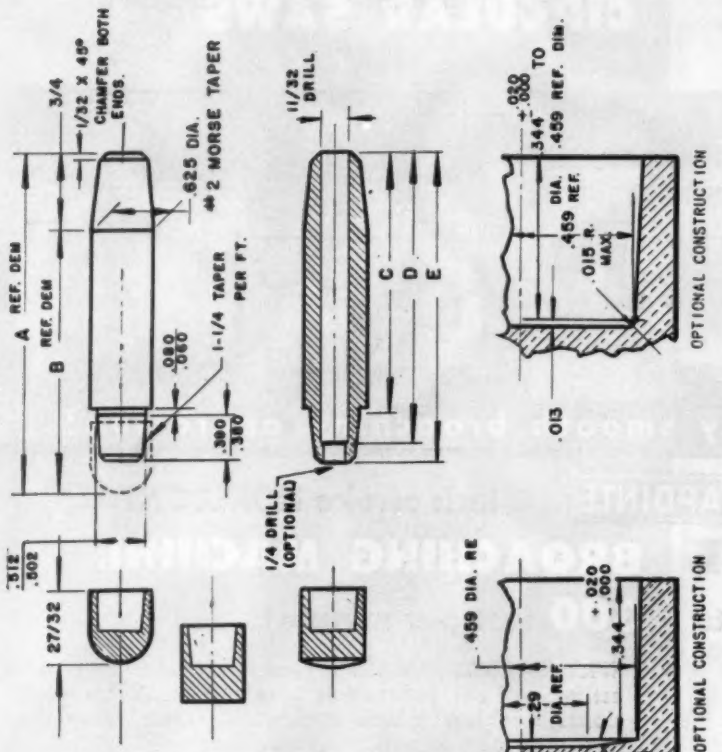
# REFERENCE BOOK SHEET

## Cap-Type Resistance-Welding Electrodes—II

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| 2-33/64 | 1-49/64 | 1-37/64 | 1-55/64 | 1-61/64 |
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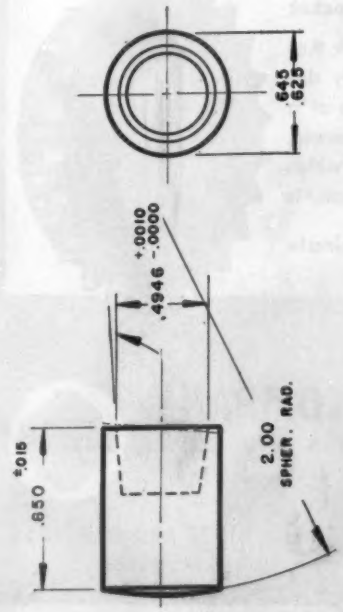
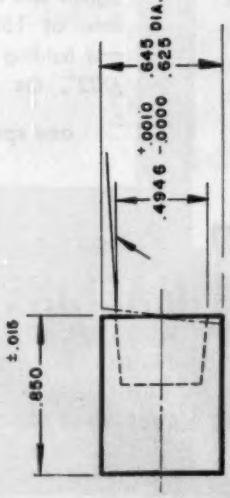
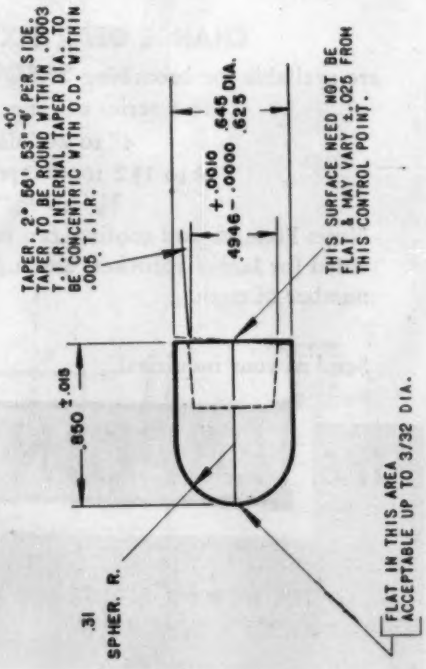
| 5-17/64 | 4-33/64 | 4-21/64 | 4-39/64 | 4-45/64 |
| 5-33/64 | 4-49/64 | 4-37/64 | 4-55/64 | 4-61/64 |
| 5-49/64 | 5-1/64 | 4-53/64 | 5-7/64 | 5-13/64 |





TAPER, 2° 56' 53" +0' -9' PER SIDE. TAPER TO BE ROUND WITHIN .0003 T.I.R. INTERNAL TAPER DIA. TO BE CONCENTRIC WITH O.D. WITHIN .005 T.I.R.
+.0010 -.0000
.4946
.645 DIA. .625
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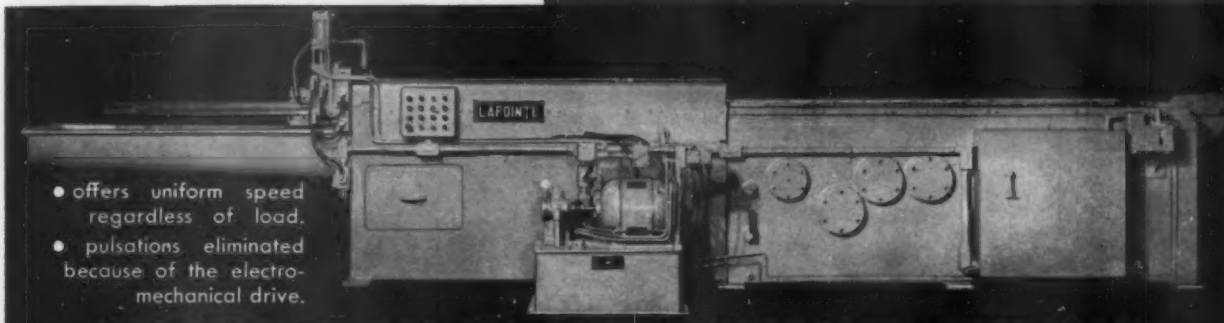


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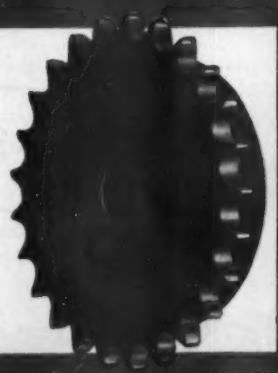

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|---|---|---|---|---|
| 1-1/2 | 1 | 5/8 | 15/16 | 1 |
| 1-3/4 | 1-1/4 | 7/8 | 1-3/16 | 1-1/4 |
| 2 | 1-1/2 | 1-1/8 | 1-7/16 | 1-1/2 |
| 2-1/4 | 1-3/4 | 1-3/8 | 1-11/16 | 1-3/4 |
| 2-1/2 | 2 | 1-5/8 | 1-15/16 | 2 |
| 2-3/4 | 2-1/4 | 1-7/8 | 2-3/16 | 2-1/4 |
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| 5 | 4-1/2 | 4-1/8 | 4-7/16 | 4-1/2 |
| 6 | 5-1/2 | 5-1/8 | 4-7/16 | 4-1/2 |


+.020 .312-.000 TO .362 REF. DIM.
.362 DIA. REF.
.015 R. MAX.
.013
TAPER, 2° 58' 53" ±6' PER SIDE. TAPER TO BE ROUND WITHIN .0003 T.I.R. INTERNAL TAPER. DIA. TO BE CONCENTRIC WITH O.D. WITHIN .005 T.I.R.
.480 .500 DIA
+.001 .394 -.000 DIA.
THIS SURFACE NEED NOT BE FLAT AND MAY VARY ±.025 FROM THIS CONTROL POINT.
±.015 .780
.38
.12 R.
.31 DIA.
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## Cap-Type Resistance-Welding Electrodes—IV




| A | B | C | D | E |
|---|---|---|---|---|
| 1-1/2 | 1 | 5/8 | 15/16 | 1 |
| 1-3/4 | 1-1/4 | 7/8 | 1-3/16 | 1-1/4 |
| 2 | 1-1/2 | 1-1/8 | 1-7/16 | 1-1/2 |
| 2-1/4 | 1-3/4 | 1-3/8 | 1-11/16 | 1-3/4 |
| 2-1/2 | 2 | 1-5/8 | 1-15/16 | 2 |
| 2-3/4 | 2-1/4 | 1-7/8 | 2-3/16 | 2-1/4 |
| 3 | 2-1/2 | 2-1/8 | 2-7/16 | 2-1/2 |
| 3-1/4 | 2-3/4 | 2-3/8 | 2-11/16 | 2-3/4 |
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| 3-3/4 | 3-1/4 | 2-7/8 | 3-3/16 | 3-1/3 |
| 4 | 3-1/2 | 3-1/8 | 3-7/16 | 3-1/2 |
| 4-1/2 | 4 | 3-5/8 | 3-15/16 | 4 |
| 5 | 4-1/2 | 4-1/8 | 4-7/16 | 4-1/2 |
| 6 | 5-1/2 | 5-1/8 | 5-7/16 | 5-1/2 |





TAPER, 2° 58' 53" +0' -6' PER SIDE.
TAPER TO BE ROUND WITHIN .0003
T.I.R. INTERNAL TAPER DIA. TO BE
CONCENTRIC WITH O.D. WITHIN .005
T.I.R.
.480 DIA.
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+.001 -.000 DIA.
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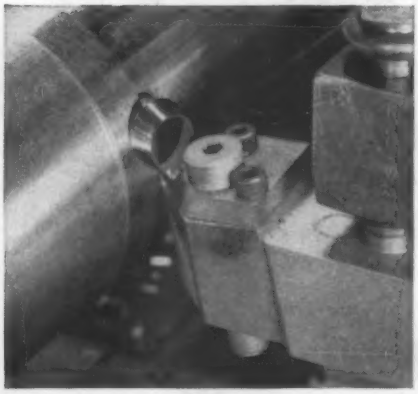
.25 SPHER. RAD.

# "You bet I specified V-R TOOLHOLDERS with "Throw-Away" blanks..."



New Exclusive V-R solid cast alloy chipbreaker plate eliminates all ground-in chipbreakers. V-R Toolholders are available with either a standard chipbreaker plate or blank chipbreaker plate that can be easily modified using any grinding wheel.

## *"They saved us $358.50 a week on one job."*

"We have to machine 750 parts a week in our plant.* Our tool cost, using brazed tools for 750 parts, was $397.50 a week. After we changed to V-R Toolholders and "Throw-Away" blanks, the tool cost for the 750 parts was only $39.00. These savings were possible because the initial cost of the cutting edge was so much lower and we eliminated all tool grinding costs. Here is a chart showing these cost comparisons."

| | Purchase Price | Grinding Cost | 5 Work Pieces Per Edge | Tool Cost per Finished Work Piece | Tool Cost for 750 Parts Per Week |
|---|---|---|---|---|---|
| Brazed Tool | $6.11 (1 Cutting Edge) | $4.56 (3 Regrinds) | 20 Work Pieces | 53¢ | $397.50 |
| "Throw-Away" Blanks | $1.58 (6 Cutting Edges) | No Grinding Needed | 30 Work Pieces | .052 | $39.00 |
| | | | | "Throw-Away" Blanks SAVE | $358.50 a week |

**An Eastern aircraft engine plant.*

These savings are typical of those that can be achieved. Get the facts on this revolutionary new development. Write for information and illustrated catalog on V-R Toolholders and "Throw-Away" blanks.

**Vascoloy-Ramet Manufacturers of Cemented Carbides**

- Blanks
- Single Point Tools
- Boring Tools
- Roller Turner Tools
- Cut-off Tools
- Grooving Tools
- Threading Tools
- Toolholders
- Inserts
- "Throw-Away" Blanks
- Wear Parts
- Carbide Rods & Tubes
- Wire & Rod Drawing Dies

**TANTUNG (Cast Alloy)**

- Solid Tools
- Tipped Tools
- Cut-Off Blades

**And A Complete Line of Tools for the Mining Industry**

**Vascoloy-Ramet CORPORATION**

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

MANUFACTURERS OF CEMENTED CARBIDES • CARBIDE TOOLS AND BLANKS • TOOLHOLDERS AND INSERTS • TANTUNG TOOLS • DIES • MINING TOOLS • INVESTMENT CASTINGS

808 MARKET STREET, WAUKEGON, ILLINOIS

# Talking Shop . . .

### Most Powerful Machine

ARMCO HAS BEEN PUBLICIZING a 3-lb machine with more than 10 billion parts, easy to carry around. Every one has one, free, for his own use; it produced the atom bomb, yet it's the only thing that can prevent the world from being blown to bits. It requires very little care, and thrives with use and kind thoughts. It can keep you on your job, bring promotion and a better living. It is, of course, your brain—the most powerful machine in the world, if you use it.

### Engineers Rise

THE ENGINEER rapidly is replacing the lawyer and the banker in top management positions in industry, according to Dr John T Rettaliata, president, Illinois Institute of Technology, Chicago. 40% of today's industrial management is engineer-trained.

### Literal

SEVERAL ARTICLES in recent issues of *AM* have stressed the importance of proper communications. A friend gave us a good example of this the other day. It seems that during WW II, unskilled workers were employed for the seemingly simple job of installing insulation on pipes in ships under construction. So there would be no misunderstanding, the foreman left word with the night crew to "cover everything round." They did just that; but the foreman was somewhat nonplussed to discover, next morning, that they had carefully insulated the entire length of the propeller shaft.

### Desk Motto for Veeps

THE VICE-PRESIDENT of a company is expected to be able to *make* things happen—to *make* profits or *make* progress in his area—in spite of anything or everything . . . VP might well stand for Verified Profit or Vital Progress—*Robert Rawls.*

### Tester

LEHIGH UNIVERSITY has just installed the largest universal testing machine in the world, a 5-million-lb unit capable of applying both tensional and compressional loads. The machine weighs 925,000 lb, is 76 ft tall overall, has 10 ft between columns, can test pieces up to 40 ft. Base structure will accommodate structures up to 100 ft long. Two screws 62 ft long, 16 in. in dia, and weighing almost 45,000 lb each (believed the largest ever made) are rotated by a 75-hp motor to set the crosshead for a test, during which they are in tension. Loads are applied by a hydraulic cylinder capable of applying 2200 psi, moving on a stationary 54-in.-dia piston in the base. Baldwin-Lima-Hamilton built the machine.

### Psyche Problem

REPORTS BUSINESS WEEK (Nov 5): Two million problem drinkers lose 22 to 25 workdays a year, cost industry $500 million . . . 100,000 workers each year lose six months of work apiece because mental illness forces them into state hospitals . . . About 30% of workers are involved in 85% of the accidents, as a result of emotional troubles . . . The seriously troubled employe has three times as many safety and rule violations, 2½ times as many grievances and medical-dispensary visits, 1½ times as many minor surgical and sick-day absences and personal-reason absences . . . Character traits caused 90% of discharges, 76% of the non-promotions in one major oil company, 85% of discharges in a 4000-discharge study of 76 companies . . . One of every 18 persons now alive will spend some time in a mental hospital, and one of every four marriages will end in divorce . . . In 127 plants, workers were found to be frustrated and galled by discrimination in dining rooms, parking lots (especially those with name tags), and toilets between executives and shops—causing union pressure for more money, as well as resentment which showed up as hostility, inefficiency, and scrap.

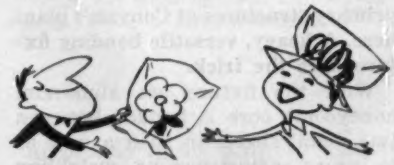
The remedy may lie in application of psychiatry, not in the hospital but in the plant, not as a remedy but as a preventive. The stake is $3 billion dollars a year cost to industry from "maladjusted" workers.

### Green Light

DESIGN ENGINEER friend tells us he never was so impressed with the smallness of a ten-thousandth inch until he found it was only five wavelengths of green light. He was also very clear on the difference between micron, mil and a mirco-inch. The micron is a millionth of a meter (thousandth of a millimeter), or 0.0000394 in., while the micro-inch is a millionth of an inch (0.000001), or roughly 1/40 as much. The mil is a thousandth of an inch.

### Fish Acids?

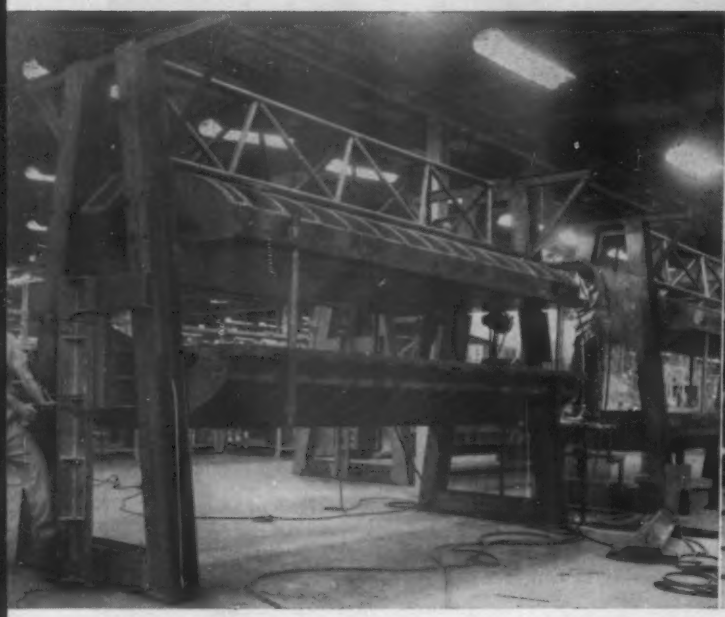
FISHERMAN FRIEND of ours recently insisted that you can't play a big fish for over 4 hr. If you try it, his mouth acids will corrode the hook through, says our friend — citing as an example the fact that big fish eat little ones, and digest 'em, bones, scales and all. We recall, on the other hand, losing a hook in a fish one day, and identifying the hook when we caught him the next. That's our fish story — but of course it was only a 12-in. trout. Ernest Hemingway's old man, in "The Old Man and the Sea," played a fish for two days, as we recall — but perhaps he used a stainless hook. In any case, it sounds as if fish acids are as powerful as hydrofluoric acid—in the fisherman's mind, at least.



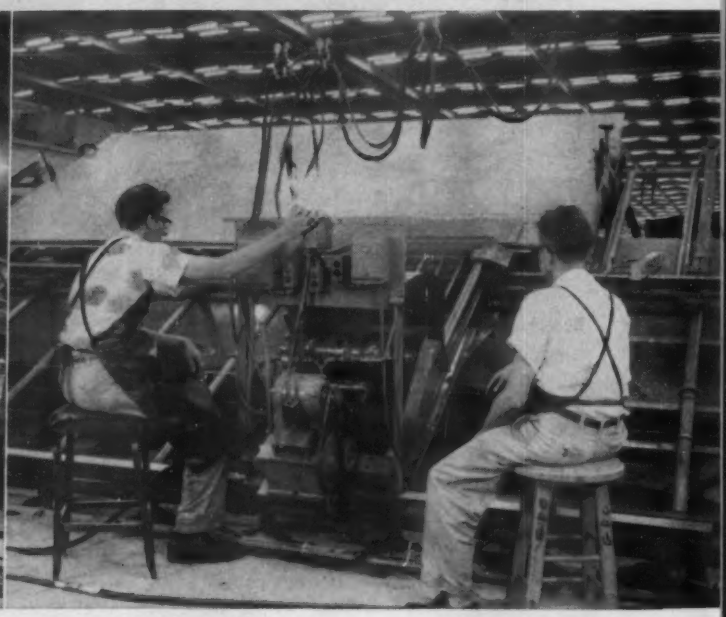
### Corsage in Cellophane

WHEN THE MANAGEMENT of one aircraft-instrument plant handed gardenia corsages to its female employes recently, those for girls on the assembly lines were neatly encased in cellophane bags. The ferns on the corsage have a way of shedding into delicate assemblies that raises havoc. . . . In the same plant, sweaters of nylon are permitted, but no others —because of flying lint. Less-publicized is the fact that girls with dandruff must be transferred—again because analysis of rejected assemblies shows a high percentage of dandruff in the dust that caused rejection.

# News of Metalworking . . .



**Rough structure is a pair of A-frames . . .** that support two heavy flat castings. Top one is fixed: bottom one is adjusted up and down by hydraulic cylinders to provide correct die opening. Restraining pins and bayonet locks hold bottom casting securely in place



**Dies are aluminum slabs . . .** that are 2½ in. thick and curved slightly to match work shape. Machine drills 1-in. holes longitudinally through each slag on 3-in. centers, four at a time. Drilling is done from both sides: holes meet in middle within ⅛ in.

## Bonding Fixtures Replace Heavy Presses

**FORT WORTH, TEXAS — Plastic bonding of all-metal sandwich structures on a production basis has eliminated need for expensive, heavy-duty presses in making wing-skin primary structures at Convair's plant here. A heavy, versatile bonding fixture does the trick.**

With the fixture, an aluminum honeycomb core is bonded between two metal sheets in such a way as to insure against parting, wrinkling or warping. Largest Convair fixture will handle a 6 x 18-ft panel, and will produce a sandwich of any foreseeable thickness. Currently, ⅝-in. thick sandwiches are being built at Convair.

### Two Plastic Bonds Used

Shell Oil's 422J plastic bonds the honeycombs to the skins: for metal-to-metal surfaces Goodrich Rubber's Plastilok 620 is used. Convair has undertaken considerable research to find a reliable system of heat transmission for the bonding process. One requirement was control of heat to plus or minus 10 F. Researchers tried electrically heated dies, steam, circulating oil and resistance heat blankets.

The steam-heated tool was found to meet requirements best and most economically. For one thing, steam source was the central steam plant that operates building heating and air conditioning at Convair's plant. It was found, too, that steam results in an absolutely maintenance-free operation. But most important, steam as a heat source brought temperature control to plus or minus 2 F on the surface of the tool — a degree of precision actually far above that required for the job.

### Reverse-Water Cooling

Another advantage of steam is that the part can be cooled by reversing tap water back through the tool. This cools the part while it remains under pressure, eliminating distortion, and controlling the rate of cooling. In early experiments, it was found that there was a tendency for the part to buckle when cooled outside the fixture.

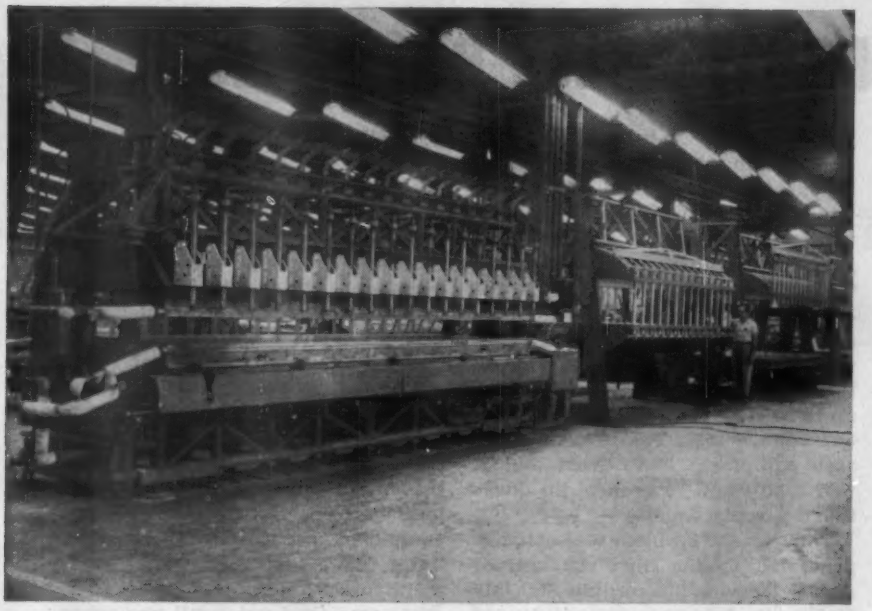
The die-like tools themselves are made from Kaiser Aluminum's 61ST66, a heat-treated and stress-relieved metal, which was found to be stable when going through the heat cycle, and which has the required even surface. Tool material is 2½ in. thick. The tools consist of both male and female structures in the case of slightly curved parts, and are drilled to create 1-in. dia holes, 3 in. on center, longitudinally, through the aluminum plate.

### Special Boring Rig

To bore these holes, Convair built a special rig, which bores four at a time using an indexing system. Holes are bored half the length of the tool: then the tool is bored from the other end. The holes intersect with ⅛ in. tolerance for variation.

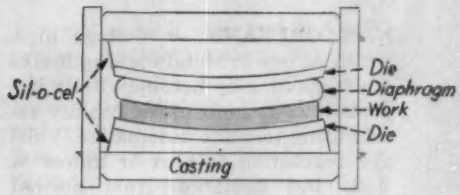
Edges of the tools are grooved so that when the tool is held in a frame around its edges, the grooves become sump ducts leading from each hole. In the fixture, the die-like tool is tilted slightly so that the condensate runs by gravity to one point, where it is released by a trap.

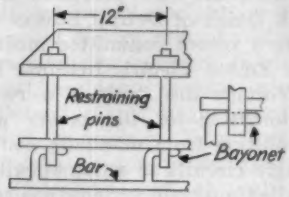
The fixture consists of two castings that remain stationary during actual

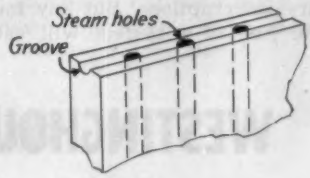


**Assembled press fixtures . . .** are jungles of restraining pins. Locked-up layers inside include two sheets of Sil-O-Cel heat insulation between dies and castings. Thin sheet-metal diaphragm goes on top of work, under upper die, is expanded against die opening to press the work

# at Convair Fort Worth




**Aircraft sandwich** is locked up as in top sketch. It may include a honeycomb core, or it may be all flat, solid stock. Details of bayonet lock are in center: all are thrown at the same time once the opening between the castings has been figured. Drilling of dies is shown in bottom sketch

application of pressure. Pressure is applied by a thin sheet-metal diaphragm that is pneumatically actuated.

### Cross Section

Starting with the bottom casting (jaw), a cross-section of the loaded fixture in operation looks this way:

Bottom casting, a layer of Sil-O-Cel for heat insulation, female tool, sandwich panel part to be bonded, compressed-air-actuated metal diaphragm, male tool, another layer of Sil-O-Cel, and the top casting.

Tools are contoured on a hydraulic press brake. The top tool doesn't have to be accurate. It is formed to shape on the press brake. The bottom tool, however, controls the surface finish of the part. The fixture itself consists of two large castings and A-frames. The upper casting is supported directly by the A-frame.

### Lower Casting Is Moveable

The lower casting travels up and down for loading and unloading (not for application of pressure) by means of a hydraulic cylinder. This action closes the gap between the castings to a predetermined dimension. Then restraining pins on each side, 12 in. on centers, drop to position.

Bayonet lock holds the two castings in a fixed position. When air pressure is applied to the diaphragm, the locked-together castings act as a restraining fixture that causes pressure to be applied to the sandwich being bonded.

### Operational Cycle

The cycle of operation: (1) close the castings, (2) lock pins, (3) apply air pressure, (4) apply steam to heat tools and part, (5) reverse water to cool, (6) exhaust air to relieve pressure, (7) remove bayonet locks, (8) drop lower casting, and (9) unload sandwich structure.

### Takes 2 Hours

This production cycle requires approximately 2 hours, including heat-up, curing and tooling time—a cycle about equal to that needed for processing sandwich structures in hydraulic presses.

According to the project's assistant chief tool engineer, G Richard Gordon, the lower casting has been made moveable primarily as a safety factor. The lower casting is prevented from descending completely to the floor, while a moveable upper casting would have been a possible source of injury during loading and unloading. In fact, the first fixture built did utilize the upper casting, which was raised and lowered by a screw arrangement. The design was later modified.

### Handles 6x18-Ft Parts

The largest of the Convair fixtures —those handling a 6 x 18-ft part— exert a restraining pressure of 1166 tons, or approximately 150 psi.

# VOLTAGE DIPS: Will They Become Electrical

NEW ORLEANS — Voltage dips, which no one in Metalworking thinks much about, may become vitally important as a result of the rapidly accelerating trend to automation. Voltage regulation to plus or minus ¾ volt, and deviation from normal voltage for not longer than one cycle, requested by some industrial customers, are not practical. So said C E Quick of Detroit Edison Co before a recent committee meeting of the Edison Electric Institute here.

Voltage dip itself is a result of automation—of the power system. Evolution from manually controlled single circuits to automatically controlled multiple systems has reduced frequent long power interruptions to voltage dips and occasional momentary interruptions. But any fault in one line of a system will cause a voltage dip for the relay-plus-breaker operating time for the system except for the faulted line itself, which has a momentary interruption while the throwover operates—or a longer one if there is only one feed.

Fastest modern relays and breakers take about three cycles to operate; most on the Detroit Edison system, while—relatively new, take 6 to 9 cycles for faults close to the bus, up to 20 cycles for faults which drop bus voltage 15%. The investment in such equipment is so great that it will take years to reduce dip duration by replacement.

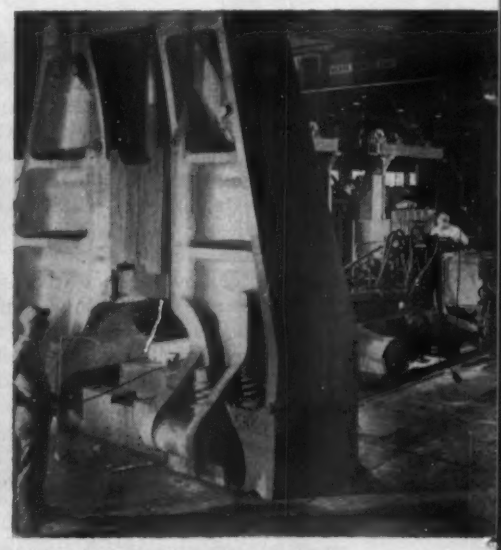
The current problem was actually generated by the high standard of utility service, according to Mr Quick. Said one large builder of automatic machines, "We have to assume the power supply is continuous. We have enough problems trying to make the mechanical parts of our machines function."

Complaints began about 1952, have mushroomed since. Study highlights these two factors: plants making complaints are principally in suburban areas, new automatic machines are most affected. Downtown Detroit has underground cables, relatively unaffected by weather, but outlying areas are served by overhead lines. Plants have been moving to the suburbs, and modernizing equipment as they move—thus hitting both problems at once. DE supplemented equipment to the capacity required —but that is not the answer. Complaints continued, but utilities in other areas had not, until two years ago, encountered this Detroit-area difficulty. Steps taken thus far are to:

# WESTINGHOUSE BLAIRSVILLE: Alloy-to-Finished-Product

BLAIRSVILLE, PA — Final link in Westinghouse's metallurgical development plan is a $6-million, all-under-one-roof Metals Pilot Plant just dedicated here. The 173,000-sq-ft plant can process wrought and cast alloys with equipment big enough to simulate actual manufacturing conditions. In effect, the new Blairsville plant provides a link between laboratory and commercial output of new alloys and processes. That's why a major part of the plant is given over to such processes as forging, hot and cold rolling, heat treating, shell molding, investment casting, and powder metallurgy. And Blairsville's equipment is much

**High and low bays . . .**
show up in this aerial view of Westinghouse's giant new 173,000-sq-ft Metals Pilot Plant at Blairsville, Pa, 40 miles east of Pittsburgh. Future expansion will be in direction of the parking lot in left foreground



**18,000-lb forge hammer . . .**
descends on ingot held by an Autofloor manipulator. Hammer does both open and closed die work

# Problem Children of the Automated Plant?

•Supplement existing double-feed system with ground-wire protection.

•Examine affected machines. Complaints covered tool breakage, magnetic-chuck release, motor starters, automatic screw machines, millers, grinders, and mercury lighting at first. Now there are added those on shutting down gas-fired furnaces and ovens and automatic plating units. A time delay on undervoltage releases protects motor starters against voltage dips, and tests indicate this to be satisfactory. Tests were made on an automatic screw machine, an automatic lathe, and an automatic turret lathe, all with 30- to 50-hp ac motors. Dips of as much as 90% for as long as 30 cycles did not damage workpiece or tools—and operators wouldn't have noticed them except that they were aware of the test. Tests on furnaces and ovens showed similar results.

**Conclusion:** Controls, in some cases at least, are more sensitive than necessary to protect machine and work.

•Next step is to check control sensitivity—particularly contactors and relays in automatic-control circuits. Makers say "We meet NEMA standards"—and they do. But the standard (IC-1954, pp1C1-11.25—Range of Operating Voltage) simply says that ac contactors shall withstand continuously 110% of rated voltage, and close successfully at 85%. For dc units, requirements are the same except for closing at 80%. No mention is made of dropout. One maker has units which drop open in 2 cycles at voltages varying with size from 32 to 50%; larger sizes (above 50 amp) drop out at 45 to 50% and in 4 to 12 cycles. Another maker has units which drop out in as little as ¾ cycle. It is obvious that contactor and relay dropout time is far shorter than the shortest breaker time. Further automation will require much faster contactor operation. Either contactor-dropout voltage must be cut materially or a flywheel-type mg set installed right on the line to avoid dips in control voltage.

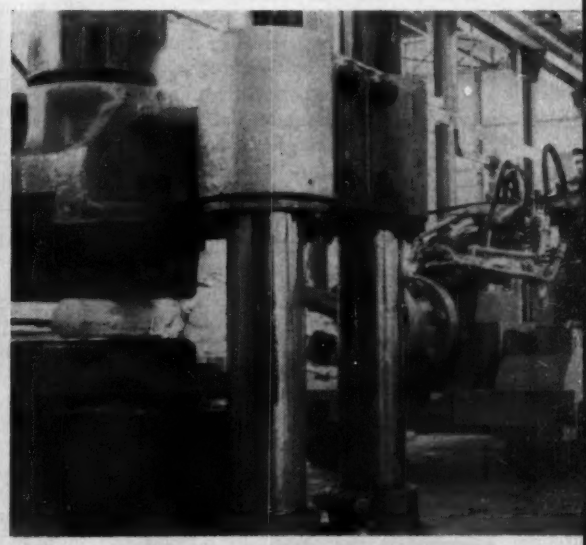
•High-intensity mercury lighting is a real problem, because many large Detroit plants have mercury only—and a mercury light extinguished takes 8 min to get started again. Complete loss of voltage causes dropoff in 2 cycles, dips of over 15% will knock out one make, 25% two others, but time factor is not known, and there will be varia-

(Continued on next page)

# Research at World's Biggest Metals Pilot Plant

larger than that of most pilot plants. For instance, there's an induction vacuum melting installation that can accommodate heats ranging from 300 to 2000 lbs. It can vacuum cast large ingots, and it can low-temperature vacuum anneal titanium. In addition, there are an 18,000-lb and three smaller forge hammers, a 1000-ton steam-hydraulic forge press, three induction melting furnaces up to 5000 lbs, a cold hearth furnace, a 1000-hp reversing hot-rolling mill, a 500-hp reversing cold rolling mill, bell and roller-rail-box electric furnaces; shot-pouring equipment, shell mold and lost-wax casting facilities, and arc furnaces.

**Stages in shell molding . . .**
shown here are (upper left) pouring metal from induction furnace into ladles, and (foreground) pouring metal into shell molds



**1000-ton steam hydraulic forge press . . .**
shapes an ingot held by a manipulator in the world's biggest pilot plant at Blairsville

# News of Metalworking . . .

**VOLTAGE DIPS** (Continued)

tions from ballast, operating conditions, and lamp life.

**Summarized Mr Quick:** "The operating characteristics of existing control contactors and relays are not compatible with practical power-system design. Control-equipment manufacturers must coordinate their designs with practical power-system characteristics. They can do so, but must be made aware of the problem and of the limitations of system design. We, of the power industry, must take the initiative in presenting the problem and its indicated solution. We must also face up to the issue—and tell our customers that while we will make every attempt to minimize voltage dips, we cannot eliminate them."

Industry's reaction to Mr Quick's contention that voltage dips may present a serious problem is mixed:

•**Detroit Transmission Division, GMC** is aware of the possibility, and has seen evidence of the problem at the plant of a Michigan machine tool builder, where equipment for the division was being tested before shipment. Voltage dip there, however, was the result of insufficient power, rather than control sensitivity. Otherwise, the Division reports no trouble at all.

•**Plymouth Engine Plant, Chrysler Corp:** no problem here. Overload is avoided, and there have been no voltage dips from other causes. Plant engineers know of other plants where worn-out breakers have caused trouble, but they were easily taken care of. No mercury lighting problem here or at General Motors.

•**Cross Co:** Detroit Edison people were in to investigate the problem a year ago, so Cross is completely familiar with the question (not problem, according to Cross). No Cross machine user has reported trouble of this nature.

•**Surface Combustion Corp:** electrical engineer R F Emch says "I agree there is a great need for something to be done to minimize these power dips. It is a responsibility which must be assumed by the control builders, power companies, and also the customer, who at times has inadequate feeders in his own plant. We have used a device made by a Detroit company to bridge the dips, preventing the drop-out of safety devices on RX prepared gas generators. This device works satisfactorily, however some method should be devised to eliminate the dips."

## "Unitized Transfer Machines" Are Answer To Fast Obsolescence, Ford Expert Says

CHICAGO—Transfer machines so standardized that the user can buy components from any machine tool builder, put them into his production line and be in business, are in the not-too-distant future. That's the opinion of Ford's machining process expert P B Skinner, who told the American Society of Mechanical Engineers' Diamond Jubilee Annual Meeting here November 13-18 that these "unitized transfer machines" will be put on the market by machine tool builders "before many years go by."

### Standardized Components

UTM's are actually no more than present transfer machines with power units, wing sections and riser blocks bolted and doweled together—with this important difference—all items except bridge sections, multiple heads and tooling would be standard throughout the machine tool industry to the degree that they could be bought in the same manner as drill bushings or electric motors.

### Four User Advantages

This would mean four definite advantages to the user, Ford believes: (1) savings effected through eliminating need to buy an entire machine and obsoleting existing equipment when product changes are required, (2) retooling time is cut because only bridge sections and special tooling will be required, (3) installation and tryout problems will be cut because unchanged portion of machine won't need tryout, and (4) increased product flexibility will result from ease in revising machines to produce new products, and from less risk in introducing new products.

Ford, Mr Skinner said, has already discussed the "building block" transfer machine concept with machine tool builders and other auto makers and intends to buy transfer machines designed along these lines.

Another ASME speaker, Alexander Zeitlin of Birdsboro Steel Foundry & Machine Co, said that U S industry can now design, build and erect a hydraulic closed-die forging press of 100,000-ton capacity dimensionally not much bigger than present 50,000-ton presses.

Michigan Tool Co's Marvin Anderson, speaking on "Automation in Gear Production," showed layout drawings for two automatic gear production lines. One of them (already installed in a plant) machines 280 "green" gears an hour from screw machine blanks. A second, now being developed for an automaker, is 1200-ft long, will produce 800 pinions an hour.

Held in three hotels, the Congress, Conrad Hilton, and Sheraton-Blackstone, the Diamond Jubilee meeting's five days of technical sessions were divided by interest into Applied Mechanics, Aviation, Production Engineering, Instruments and Regulators, Heat Transfer, Fluid Meters, Hydraulics, Fuels, Machine Design, Safety, Boiler Feedwater Studies, Power, Wood Industries, Education, Metals Engineering, High-Temperature Steam Generation, Gas Turbine Power, Management, Mechanical Pressure Elements, Oil and Gas Power, Railroad, and the meetings of the American Rocket Society. Upwards of 600 authors and co-authors presented papers on these subjects in five days of technical sessions attended by about 5000 people.

## Russian Pipe Dream: Triple Output of Automated Tool Lines by 1960

MOSCOW — (McGraw-Hill World News)—Russia's Sergo Ordzhonika Machine Building Plant, the Soviet's only producer of automatic machine tool lines, has been ordered to triple its output during the Sixth Five Year Plan (1956-1960).

Already scheduled this year to produce twice as many machine tool lines as last, the plant is reported by the communist party newspaper *Pravda* to have increased its gross output by 58.7% during the Fifth Five Year Plan (1951-1955). The tripling of automatic machine tool line output, and a 50% increase in gross output by 1960, is supposed to be done without any increase in working space at Sergo Ordzhonika.

And the plant has some serious shortcomings, according to its director: "We still suffer great losses from delayed delivery of parts for assembly, from failure to meet deadlines for castings, and from a high percentage of machine shop rejects. We also have insufficient space in the assembly shops."



Field Report USA:

# Re-Planting Time in Pennsylvania

## East...

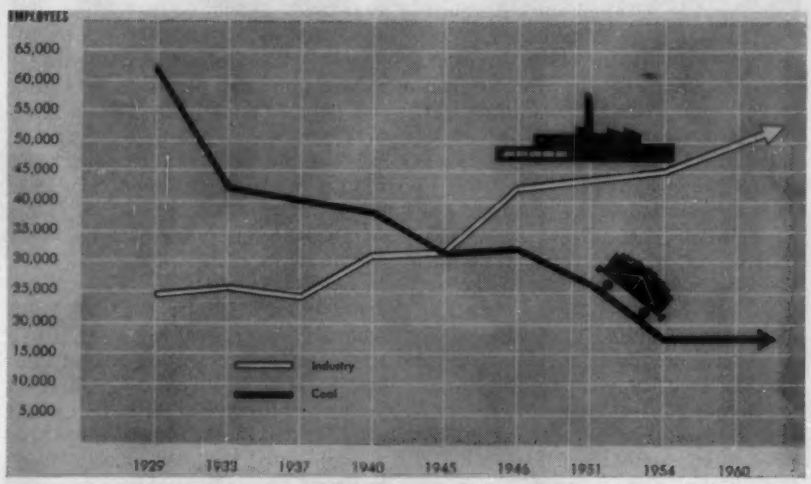
SCRANTON-WILKES-BARRE, PA —They've been fighting an uphill battle against unemployment in this area for a good many years — ever since the demand for the anthracite of these Blue Ridge valleys started to peter out. The people here are of good hard-working stock — that is, when there's work to be had. They're coal miners and the sons of coal miners — first generation most of them — Poles, Italians, Irish, Czechs, Ukranians, even a sprinkling of descendants of the Welsh miners who opened up these hills. They're a people used to hard work: a day in a coal mine would put the average desk man in hospital for a week.

Trouble is, oil, gas and electricity have made drastic competitive inroads into the demand for anthracite. Take this Lackawanna Valley, for instance. Not too many years back, 45,000 men worked in the mines. Now there are less than 3000, and lots of them aren't working full time at that. In all, 14,900 people are out of work in the Lackawanna Valley. Southwest 18 miles, around Wilkes-Barre, the Wyoming Valley has 15,000 men and 5000 women out of work, better than 10% of the total population. The worst part of it is that the jobless are mostly men—breadwinners for big families.

This is what the government calls a distressed labor surplus area. Think it's bad now? You should have seen it back in '46, when the World War II GI's came home to no jobs and the alternative of joining the 52-20 Club and loafing on the street corner, or hitting out for greener job pastures.

Business was bad all over here then, and it was getting worse. You can't buy things without money, and not many people can get money without working for it. That's why business people and civic leaders in the hub cities of this region went into action.

It was pretty obvious to everybody that the two cities would one day be the nucleus of clusters of coal-mining ghost towns, unless new and diverse industries could be brought in to replace mining. Then, as now, one thought was in the minds of everyone here — to create jobs, jobs, and more jobs, not so much for women — light industries like textiles and cigarmaking took pretty good care of them—but for men.




**New jobs for coal miners is the problem . . .**

as typified by the Wilkes-Barre area. As the demand for anthracite decreases and the roster of employed coal miners gets smaller and smaller, local businessmen and civic groups are bringing in new industries to create jobs. According to this chart published by the Greater Wilkes-Barre Chamber of Commerce, the break-even point was reached in 1945, and Wilkes-Barre's efforts have since been on the credit side of the ledger. A similar situation, but on a larger scale, exists in Scranton and the Lackawanna Valley of Pennsylvania

Wilkes-Barre and Scranton went about it in similar ways. Down at Wilkes-Barre, Bill Sword, petroleum dealer, sparked a bring-industry-to-town movement. He headed up a "Committee of 100" business people and civic leaders who raised enough money to bring in an engineering firm to make an exhaustive study of the Wyoming Valley's potential for new industry.

The idea was to find nearby areas that could offer rail, power and water facilities. Four such areas were found: (1) the Back Mountain area around Dallas, 8 miles away; (2) 10 miles up toward the Poconos at Bear Creek, (3) vacant sites in Wilkes-Barre itself, and (4) a 1500-1800 tract up at Mountaintop, 8 miles southeast. Of the four areas, Mountaintop offered the best package.

All this research took time, and it took money, raised by a Greater-Wilkes-Barre Industrial-Fund campaign that netted $250,000. Of this, $36,000 went for leveling and clearing 1200-1500 acres and bringing in utilities at Mountaintop. That's how Crestwood Industrial Park came into being. But it was an industrial park without an industry.

"Okay, you've got the park, but who's going to move in?" the utilities people wanted to know. They had good reason. It would cost them upwards of $11 million to put in a railroad spur and power and water facilities.

The first olive wasn't long in coming out of the industrial bottle: Foster Wheeler Inc, pressure vessel manufacturer. By that time, 1952, a second campaign, "Operation Jobs," had netted the Greater Wilkes-Barre Industrial Fund $750,000. The Fund took $250,000 of this money and made an outright gift of it to induce Foster-Wheeler to move in. That was the only such gift the Fund made.

The other $500,000 went into other industries in the form of second mortgages. In other words, the law said local banks could take a maximum of 60% mortgage money on the value of an incoming plant, so the Fund made up the remaining 20% on a 15-20-year lease-purchase arrangement at 4½% interest.

This brought in some 15 new industries, including King Fifth Wheel Co, Teleradio Engineering Corp,



Field Report USA:

## Field Report USA:

Superior Combustion Industries Inc, Muskin Mfg Co, Woodbury Mfg Co, and United Steel & Wire Co — plus two textile firms, three shoe manufacturers, a furniture maker, a warehouse and Bell Telephone's Accounting Division — 15 firms in all. Latest to arrive (they're just breaking ground now) is the famous old pencil and eraser manufacturer, Eberhard Faber, moving out of its old dingy Brooklyn plant to a place where it can expand.

The new industries brought, or are bringing, 4600 jobs to the Wilkes-Barre area, along with a $15.5-million annual payroll. But that isn't the end of Wilkes-Barre's fight by any means. Currently, Campaign No 3, "Operation *More* Jobs" has raised another $750,000, with another $150,000 expected in. This will go into second mortgage money, too ("We have plenty of hot prospects on the fire. We're just waiting for more money to go ahead"), and it won't stop until Greater Wilkes-Barre's army of 12,744 unemployed men and 3270 women go back to work. That 3-1 man-to-woman jobless ratio, incidentally, is responsible for the Fund's inflexible requirement: aid will be given only to an incoming industry that employs at least 60% men.

Up at Scranton, 18 miles to the northeast of Wilkes-Barre, they call their industry-getting campaign "Operation Bootstraps." It's administered by Chamber-of-Commerce-sponsored LIFE (Lackawanna Industrial Fund Enterprises).

The LIFE Plan has been spectacularly successful — and on a bigger scale than Wilkes-Barre's, since Scranton is a bigger city. The Plan is the fourth such industrial development effort Scranton has made on behalf of the Lackawanna Valley since 1914, when Murray Corp of America was induced to move in.

The LIFE Plan took over Lackawanna Valley industrial development in 1950 after its predecessor, SLIBCO (Scranton-Lackawanna Industrial Building Co) had brought in 11 plants, including Harris Hub Bed & Spring Co, Trane Co, and U S Textile Machine.

Basic difference between LIFE and the Wilkes-Barre Fund is that, if necessary, LIFE builds plants of various sizes and puts them "on the shelf" until a tenant comes along. Of course, it will also "build to suit" for a tenant. Here, as at Wilkes-Barre, the requirement is that the newcomer industry will employ 60% male help.

How well is LIFE succeeding? The place to look is at the Lackawanna Valley's unemployment statistics. A year ago, 17,800 were jobless. Today: 14,900. This whittling-down-of-unemployment has been going on for a long time and the since-1914 civic self-help record has been impressive: 50 new plants bulit, and 65 existing plants expanded. The LIFE Plan alone, since its creation in 1950, has brought in such industrial giants as Poloron Products Co Inc (the people who made Scotch coolers), Daystrom Instrument, which incidentally paid off its $600,000 LIFE second mortgage 11 years ahead of schedule; W L Maxson Co, and Federal Electric Products Co. U S Hoffman Machinery Co, while it doesn't come under the LIFE Plan, has just moved into the old Lackawanna Railroad Shops in Scranton to make shells. It will eventually employ 2000 men.

At the moment, LIFE has three new plants under construction and has already found a Pacific Coast firm as tenant for one. Added up, Scranton's community-financed industry has paid off in upwards of 7000 new jobs and an annual payroll of $25 million or so a year, and three plants—Harris Hub Bed & Spring Trane Co and Poloron—all in Scranton less than seven years, are undertaking major expansions to their new plants.

Make no mistake, things are still tough in these coal mining valleys, where the line of demarcation is sharp: either you're a "have" with a job, or a "have not." And there are still far too many of the latter. But if you're one of the "have nots" it's something to know that there are increasingly fewer of you every day, because the "haves" are doing everything in their power to make you one of them. You get the feeling out here that the "Lord helps those who help themselves" spirit of these people will one day soon remove the distress-area tag from these valleys.

### Brrrr!

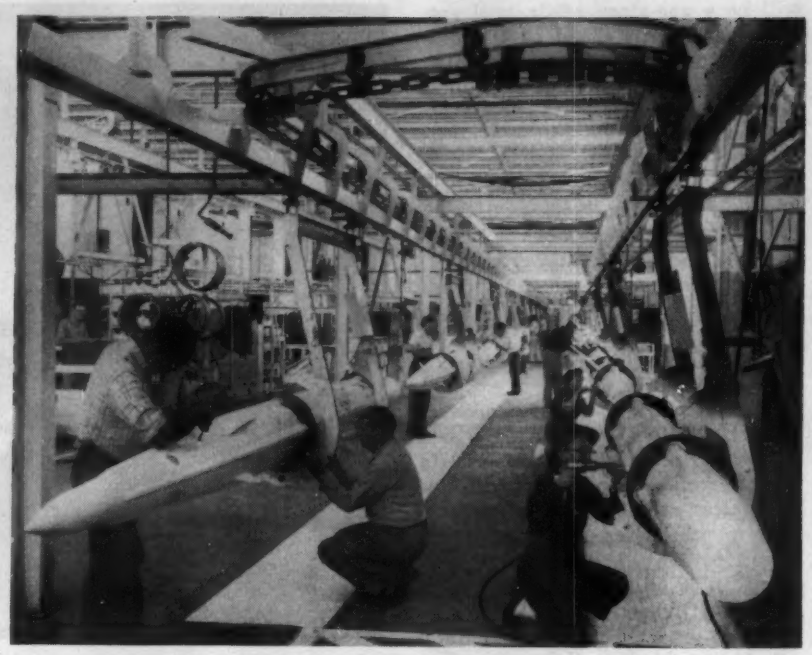
NEW YORK—If you want to test your product or processes under Polar conditions, there's still space open in the American Polar Basin Expedition, slated to leave New York February 20 to follow Admiral Peary's 1909 route. The APBE will study temperature effects on metals and plastics, along with things like classifying ice types and doing some high-altitude weather forecasting. Among sponsors of the expedition so far are Alcoa, RCA, the AEC, Longines-Wittnauer and Olin-Mathieson's Winchester-Western Division. The expedition, which will be the first from North America to reach the pole (Peary missed it because of faulty instruments) will go partly by plane and partly by dog sled. It will still take on commercial research projects relating to its general plan of operation. If you're interested, write American Polar Basin Expedition, Suite 1114, 501 Fifth Ave, NY 17.

### Eastern newsbriefs . . .

Middle Atlantic nonfarm employment is at a 21-month peak, with work-weeks averaging better than 40 hours, and wages at an all-time high . . . Pittsburgh's **H K Porter Co** has purchased **Henry Disston & Sons Inc,** maker of files and tools, for $6 million. Five subsidiaries, two in the U S, and one each in Canada, Australia and England, go with the deal . . . **Eagle Lock Co,** Terryville, Conn, has changed its 123-year-old name to **Eagle Lock & Screw Co . . . American Radiator & Standard Sanitary Corp** has formed a **Ross Heat Exchanger Division** at Buffalo . . . **Birdsboro Steel Foundry & Machine Co** will make four extrusion presses for **Kaiser Aluminum.** Three will be 2750-ton hydraulics, the fourth will be a 3500-ton hydraulic . . . **Bridgeport Brass,** Bridgeport, Conn, has settled with the Brass Workers for a packaged 13½¢-an-hour increase . . . **Van Norman Co** has acquired **Transitron Inc,** New York electronics manufacturer, will move it lock, stock and personnel to Manchester, N H . . . At a talk before Washington's National Press Club, **Chrysler** President L L Colbert said Chrysler will spend $1 billion in the next five years for plant expansion and research . . . **Kollsman Instrument Corp** has started building a 157,000-sq-ft plant at Syosset, L I . . . **Westinghouse** has set up an industrial electronics manufacturing facility in Baltimore . . . **R Hoe & Co Inc,** Bronx, N Y, printing press maker, is making its precision manufacturing skills and facilities available to industry on a contract basis. Setup is called the **Contract Manufacturing Division,** can produce anything up to complete machine tools . . . **Atrax Co,** solid tungsten carbide tool maker is expanding its Newington, Conn,

# Field Report USA:

plant, and increasing its custom-made machinery output . . . **Loewy-Hydropress** has its second order for a rolling mill for **Kaiser Aluminum's** new Ravenswood, W Va, Works. It's to be a high-speed, 4-high foil mill . . . J W Corey, president of Reliance Electric & Engineering Co, Cleveland, was elected president of the **National Electrical Manufacturers Association** at NEMA's recent meeting in Atlantic City . . . The "Operation Bootstrap" idea (see lead Field Report article) has been picked up by distressed-textile town of Pittsfield, Me. They've persuaded **Edwards Co,** Norwalk, Conn, electronics makers, to move into town and employ 400 . . . Rhode Island jewelry makers say business is running anywhere from 10 to 50% ahead of last year. Employment is at peak and there's a help shortage . . . **Ansonia Wire & Cable,** Ansonia, Conn, is building a $1-million, 120,000-sq-ft plant at Cumberland, R I . . . **American Radiator & Standard Sanitary Corp** has an option on a 55-acre Windsor, Conn, site, where it plans to make plumbing and heating equipment . . . **Tracerlab Inc** will move into a new plant outside Waltham, Mass, next summer.



## Production-Line Output of Guided Missiles . . .

**IS HIGHLY MECHANIZED AT DOUGLAS SANTA MONICA.** This is part of the overhead conveyor line that carries the Nike through various stages of assembly, including the automatic paint and drying booth

## South . . .

**Southern newsnotes . . .**

**Atlantic Steel Co,** Atlanta, has placed its products on allocation. Base period is entire year of 1954, plus first half of 1955. Company figures that allocation will continue at least through first half of 1956 . . . **Ingalls Shipbuilding and Drydock Co** of Pascagoula, Miss, launched its 167th ship on November 10—the USS Spiegel Grove, for the Navy. Company reports booming shipbuilding business. Latest contracts call for additional off-shore drilling platforms and two 135-ft drilling rig supply vessels . . . **J M Tull Metal & Supply Co,** Atlanta, already the South's largest warehouser of metals and industrial supplies, has purchased control of Florida Metals Co, Tampa, which maintains warehouses in Tampa, Jacksonville and Miami. Company handles aluminum, stainless steel, brass and copper, carbon steel and accessories. Tull President Pollard Turman said the merger will bring total volume to about $20 million . . . **Lockheed-Marietta** has received its fourth and largest contract to date, for manufacture of the C-130 Hercules transport, from the Air Force. Details are under wraps but the company announced contract was considerably in excess of anything received to date. Third contract, received by the plant a year ago, was valued at about $100 million. Lockheed is now Georgia's largest individual employer, with more than 22,000 workers—close to 10,000 more than a year ago . . . Three-day walkout of union employees at **Extral Corp,** Miami, ended when **AFL Bridge, Structural and Ornamental Iron Workers** ratified a two-year contract. Company makes aluminum products. Contract calls for immediate pay boosts ranging from 2 to 12¢ per hour, with an immediate across-the-board increase of 7¢ per hour. A similar contract was also signed with **Vulcan Inc** of Hialeah, a steel fabricating firm . . . **Douglas & Lomason Co** of Detroit has opened a new plant at Newman, Ga, for the manufacture of stainless steel trim for automobiles. It's the company's second plant in Georgia, the first was opened at Carrollton earlier this year . . . 1955 edition of the *Georgia Manufacturers Directory,* listing some 16,000 firms and their products, is now out. Price is $3. Copies can be had from Georgia Department of Commerce, 100 State Capitol, Atlanta.

## Midwest . . .

**Midwestern briefs . . .**

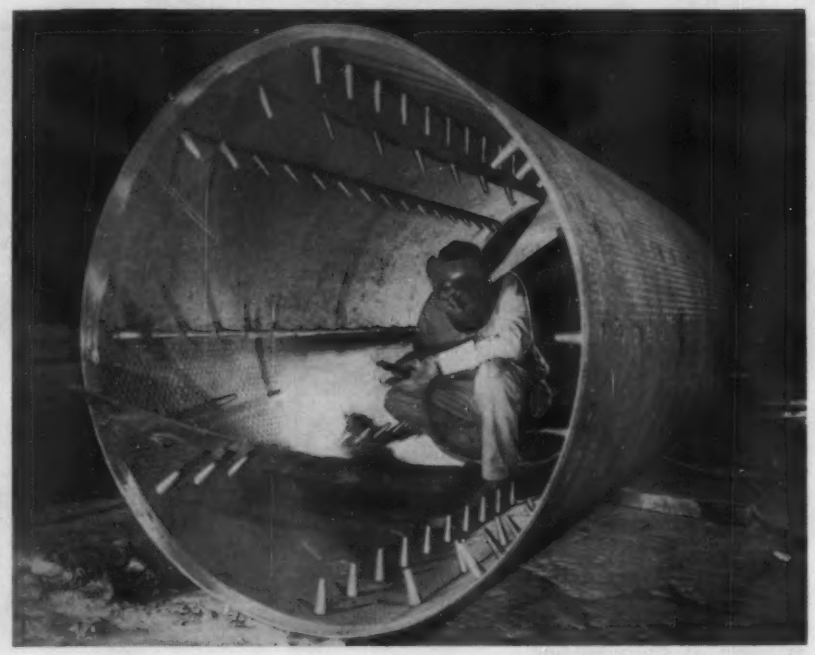
**Ford** will build a one-story, 1,668,000-sq-ft automatic transmission plant on a 193-acre site in Sharonville, Ohio, 12 miles northeast of Cincinnati. The plant will be completed in January 1957 and first transmissions will roll off the lines by the latter part of that year. Operating at peak output, by mid-1958, the plant will employ 4500 with an annual payroll of $23.5 million . . . **Warner & Swasey** has settled with Local 1253 IAM for a 12-19¢ an hour increase for about 1500 workers. Average employee increase of 14.7¢ includes 10¢ an hour extra for second shift workers, and 15¢ an hour for third shifters . . . **Chrysler** will build its $85-million stamping plant 12 miles north of Akron at Twinsburg, Ohio . . . Chicago's **Cory Corp** (the coffeemaker people) has bought out **Mitchell Mfg Co,** Chicago air conditioning and lighting fixture maker . . . **International Metal Hose Co** is moving into a double-present-capacity plant at Bellevue, Ohio . . . **Ford** is also building a 1.2-million sq ft steering gear and cold heading plant on the north edge of Columbus. It

will be a one-story affair, will employ 3000 when it opens in mid-1957 . . . **Second Midwest Welding Conference** will be held at Illinois Tech February 1-2, Chicago . . . **Clark Equipment Co** will expand its new Construction Machinery Division plant at Benton Harbor, Mich, by 50%—includes 125,000 sq ft of new manufacturing space . . . **Leece-Neville Co,** Cleveland, credits its 1955 31% increase in earnings to improved internal operations and manufacturing facilities . . . **Fansteel Metallurgical Corp,** North Chicago, Ill, will spend $1 million in expanding its titanium-columbium production . . . **Willys** Jeep sales are at a 2-year peak . . . **Allis-Chalmers Mfg Co,** Milwaukee, expects to hit an all-time sales record this year, reports nine months' sales are running 50% ahead of 1954 . . . **Eaton Mfg Co** plans an $8-million expansion of its Aircraft Division at Battle Creek, Mich, to increase output of titanium jet engine blades. Valve Division, also at Battle Creek, will be expanded, too . . . **Cincinnati Milling's** Dutch subsidiary, **Cincinnati-Netherlands,** is reported running at 50% capacity with an upswing anticipated shortly . . . **Snyder Tool & Engineering** has purchased an 18,000-sq-ft brick building just around the corner from its main Detroit plant, will make it a warehouse . . . UAW-CIO has settled with **Detroit Gasket & Mfg Co's** five plants for a 28¢-an-hour package increase for its 1975 employees . . . **Ex-Cell-O Corp's** plants are back in full swing after their recent strike . . . UAW-CIO and **Electric Auto-Lite** have settled on a 21¢ package increase for EAL's 16,000 workers . . . **Curtis Mfg Co,** Cleveland, has taken over the **Lewis Machine Co,** Cleveland, maker of wire cutting and straightening machinery . . . **Canton Stoker Corp** has purchased **Wagener Steam Pump Co,** 69-year-old Canton maker of steam and power pumps.

## West . . .

### San Francisco notes . . .

**Norton Co** has put the first abrasive-wheel-making machine into operation at its new $1.3 million Santa Clara plant. The press makes 2½-in.-dia-and-smaller internal grinding wheels. When the plant gets into full swing early in '56 it will make wheels up to 14 in. dia . . . People at **Dodge's** San Leandro plant say Chrysler President L L Colbert's Washington speech was the first they knew that San Leandro would get a piece of Chrysler's five-year, $1 billion expansion money. An earlier announcement said the plant would be sold or leased. The 98-acre plant now employs only 50 . . . **Ryan Aeronautical** says its new Firebee target drone contract assures missile output well into 1956 . . . **Southern Pacific** has placed a record order for freight cars—10,700 of 'em, to cost $90 million.



## Torture Chamber?

**No, it's just a device used by U S Steel's Johnstown, Pa, Works for removing "whiskers" from newly made nails. Whiskers drop through small holes in the cylinder as it rotates to condition nails for final cleaning operations**

### Los Angeles area briefs . . .

**North American Aviation** is forming three new divisions: (1) Autonetics Division to handle electromechanical engineering and manufacturing, (2) Rocketdyne Division, to research, develop and make rocket engines, and (3) Atomics International, to handle nuclear engineering and manufacturing . . . Orders for the **Douglas** DC-8 jet transport have extended that company's commercial backlog at least through 1961. So far, Pan-Am, KLM, United and National airlines have ordered 69 all told for a cost of $420 million. This ups Douglas's total commercial backlog to around $1 billion . . . **Kenco Mfg Co,** Los Angeles punch press builder, is doubling its plant area. Helping to pay for it is a 100% sales increase this year . . . **California Doran Heat Treating Co** is spending $250,000 to up its output 40%.

### Elsewhere in the West . . .

**Henry J Kaiser Co's** Engineers Division has come up with one of the biggest outside-U S steel plant construction jobs ever awarded an American firm—building and designing a $130-million expansion for **Tata Iron & Steel Co Ltd** at Jamshedpur, India . . . **Boeing Seattle** has a $135-million order for 30 jet airliners from American Airlines, with the first plane slated for June 15, 1959, operation. This is Boeing's second 707 jet stratoliner contract (the first: 20 for Pan-Am) and the two orders will stabilize Seattle area employment. Boeing employs 40,000 there. Boeing is currently battling **Douglas** for an Eastern Airlines order for 20 more jet airliners . . . **Frank R Cook Co,** new (last July) designer and maker of aircraft electronics equipment at Denver, has bought out Denver's **Hart Machine & Mfg Co,** tool and die shop . . . **Babb Co,** Phoenix aircraft parts maker has bought the $970,000 inventory of **H & E Aircraft Co,** Oklahoma City, and **Pacific Airmotive's** 95,000-sq-ft plant at Linden, N J. The Oklahoma City inventory, mostly Douglas DC 3 equipment, will be moved to Phoenix.

**Charles F Myers,** vice-president, sales, Morse Twist Drill & Machine Co, has been named president of the company (for additional Morse appointments, see below)

**Fred S Haas,** formerly associated with the Cincinnati Milling Machine Co, has been appointed director of product engineering of National Automatic Tool Co, Richmond, Ind

**Grant S Diamond,** president of Electro Refractories & Abrasives Corp, Buffalo, has been elected 1956 president of the Grinding Wheel Institute

# Names in the News . . .

Morse Twist Drill & Machine Co, affiliate of Van Norman Co, has named President **James Y Scott** chairman of the board; **Charles F Myers,** president (see above); **J J Hayes,** executive vice president and general manager. Van Norman Co has changed its name to Van Norman Industries Inc. Operating under the new name will be the Van Norman Machine Co of Springfield, Mass, with **Charles R Crowder** as president; the Van Norman Automotive Equipment Co, Springfield, with **Selby Greer** as president; Morse Twist Drill & Machine, New Bedford; Super Tool Co, Detroit, **Gordon Birgbauer,** president; and the Insuline Corp, Manchester, NH, **S J Spector,** president. Mr Scott will be board chairman of all the companies.

Ekstrom, Carlson & Co, Rockford, Ill, appointments . . **Ray C Reinhartsen,** formerly vice president and general manager of Onsrud Machine Works, Chicago, to general sales manager; he succeeds **Fred J Heid,** named exclusive representative to the aircraft industries in the eastern half of the US; and **G R Gordon,** formerly assistant chief tool engineer in charge of manufacturing research for Convair, named company representative in the western US.

**Howard L Walker** has been elected vice president of Warner & Swasey Co, Cleveland. He had been president of the Duplex Truck Co, Lansing, Mich, until its recent acquisition by Warner & Swasey. The company will be operated as a W&S division, with Mr Walker as general manager.

Michigan Abrasive Co, Detroit, appoints . . **C H Wills** (left), vice president, sales, to a newly-created vice presidency in the company; **W S Hoskin,** sales representative, to general sales manager

**Hoyt C Pease** was elected president, and **Eugene J Muldoon** vice president of the Service Tools Institute at its recent annual meeting at the Edgewater Beach Hotel. Mr Pease is vice president and general manager of the Stanley Tools Division of the Stanley Works, New Britain, Conn. He has been active in the industry's tariff and trade programs looking toward adequate protection of the hand tool industry which now is threatened by low labor cost imports. Mr Muldoon is sales manager of the hand tool division of the New Britain Machine Co, New Britain, Conn. He has recently coordinated within his own company the acquisition of the hand tool division of the Blackhawk Mfg Co, Milwaukee, Wis, now a part of the New Britain company.

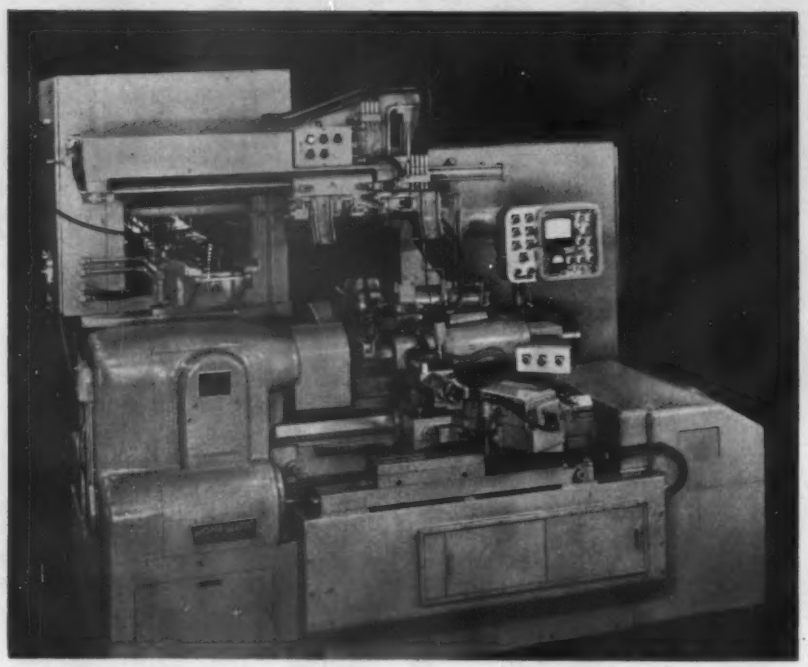
**William A Roth,** vice president and former assistant general manager of Cleveland Pneumatic Tool Co, has been named general manager to succeed **Vern R Drum,** who has retired.

**James F Rafferty,** formerly plant manager of Viking Air Conditioning, has been appointed vice president and general manager of Pneuma-Serve, Inc, Cleveland.

## OBITUARY

**Jean Pierre Wasserman,** 82, expert on alloys, and inventor of a new method of welding metals at lower temperatures, died Nov 20 in Basle, Switzerland. Mr Wasserman founded the internationally known Societe des Soudures Castolin in Lausanne, manufacturer of welding alloys. He was the father of Rene D Wasserman, president of the Eutectic Welding Alloys Corp, New York.

# New Shop Equipment,



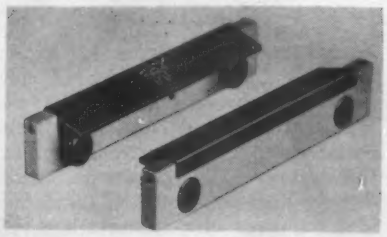
## Automatic Loader For Monarch Mona-Matic 21 Lathe

Hydraulically - actuated automatic loading mechanism for Mona-Matic 21 lathe incorporates a gravity chute and shuttle conveyor designed to hold a supply of rough workpieces to be machined on lathe.

Loader automatically positions each workpiece between work centers of the machine, triggers the program-controlled four-cut work cycle of the lathe, and finally removes each finished piece from machine when the desired cuts are completed. No manual control is required for operating sequence; loading mechanism and lathe function continouously as long as loader's conveyor chute has a supply of workpieces.

Automatic loader is arranged so that it can be connected to other loader-equipped machines for automation operations.

*Monarch Machine Tool Co, Sidney, Ohio*

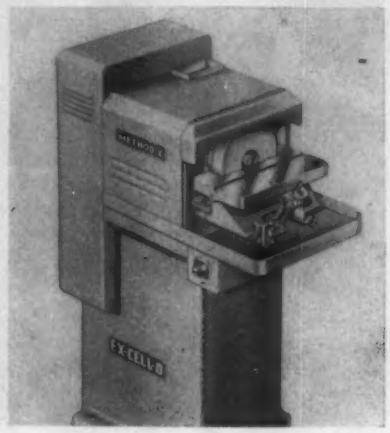


### Magnetic Hold Downs

No. 903D is addition to Miti-Mite line of magnetic hold downs. Made of hardened tool steel, 5-in. tools are swivel-mounted in a polished aluminum plate 6 in. long. Plate contains two permanent magnets, spaced 3¾ in. apart, that attach to jaws of a vise.

Hold downs can be attached to vise at any angle; secure positioning eliminates need for blocks or shims. Retail price: $12 per pair.

*Lufkin Rule Co, Saginaw, Mich*



### Ex-Cell-O Machine Sharpens Carbides Without Diamonds

Method X is designation for process which sharpens carbide tools by electrospark machining instead of by using abrasive or diamond wheels. Style 43 tool sharpener incorporates process, which is designed primarily for off-hand sharpening of single-point solid-carbide or carbide-tipped tools.

As a wheel, machine uses a 10-in. cast-iron disk connected to serve as the negative terminal of an electric circuit. Tool is similarly connected to become the positive terminal. Semi-solid dielectric film applied to to the disk provides a spark gap of proper distance between tool and disk. As tool moves back and forth across wheel face, current pulsations are released as spark discharges, with result that a minute particle is removed from the tool. Since resulting crater depth and diameter are proportionate to energy discharged per pulse, rough or finish cuts can be obtained simply by setting a power selector switch.

According to maker, method does not cause parallel or uni-directional tool marks, heat checks, or grinding cracks. Method reportedly will work materials of extreme hardness; virtually any electrically conductive metal can be worked on the sharpener. No coolant is used in the sharpening process.

*Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich*

# Materials and Parts . . .

## Brier-Mist Coolant System Offers Controlled Spray

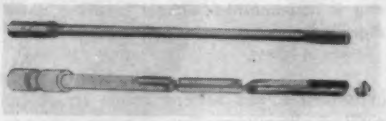
Three models are adaptable to a variety of machines, including grinders, drills, boring mills, planers, and punch presses. System uses a heavy-duty water-soluble coolant to provide a controlled spray directed at tool work point. According to manufacturer, unit provides steady flow for 8 hours on as little as 2 quarts of coolant.

Up to four nozzles are available on Models M and S, which have 2-gal. capacity. Model M turns all nozzles on or off with one switch; on Model S each nozzle has its own control switch. Two models are 18 x 14 x 9 in., weigh 45 lb.

Units are equipped with air pressure regulator which is connected directly to shop air line. Operating pressure is 2 to 20 psi; less than 0.4 cfm of air is required.

Additional unit, Model J (not shown), is available. Unit has only one nozzle; dimensions are 7 x 10 x 7 in., weight 17 lb.

*Brier-Mist, Div of Brierley D, Inc, Box 534, Oak Park, Ill*



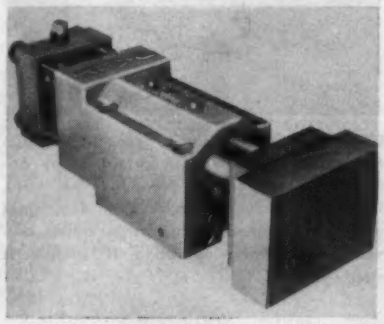
## Chicago-Latrobe Gun Drills For Shallow and Deep Work

Carbide gun drills are recommended by manufacturer for drilling of both shallow and deep holes. Used as a boring tool on high-speed spindles, short holes may be bore-drilled; tool is rotated for this operation. For deep-hole drilling on rifle-drilling machines, work is rotated while stationary drill is fed into the work.

In both bore-drilling and rifle drilling high cutting-fluid pressures are required and a uniform feed rate must be maintained. Cutting-fluid pressures generally used vary from 250 to 800 psi. Feed rate is dependable upon the material and other operating variables.

Tools are available in the following ranges of sizes: ¼ to ½ in. for bore-drilling; ¼ to 1 in. for deep-hole applications. Sizes ¼ to 19/64 in. are furnished with solid carbide heads; sizes 5/16 to ½ in. are available with either solid carbide heads or carbide-tipped heads; sizes over ½-in. diameter are provided with carbide-tipped heads.

*Chicago Latrobe, 411 W Ontario St, Chicago 10, Ill*



## Hydraulic Ram Units For Press Operations

JACY units can be mounted in a fixture or machine for performing various press operations.

Each unit contains a rugged, accurately-guided ram to which various types of press tooling may be attached. They can be grouped about an irregularly shaped part to perform several operations at once.

Produced in two types: a side mounted series, available in a variety of strokes, and an end-mounted series, available in a single short stroke. Both series are furnished in three capacities—5000, 7000, and 10,000-lb thrust per 100° psi.

*Modern Engineering Service Co, 1695 Twelve Mile Rd, Berkeley, Mich*

## . . . including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Preselector lathes ..... page 192
Radial drillpress..... page 192
Cutoff machine ..... page 196
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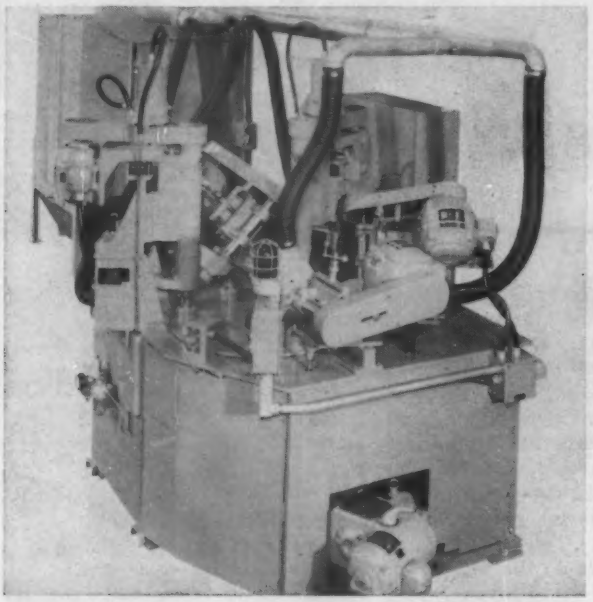
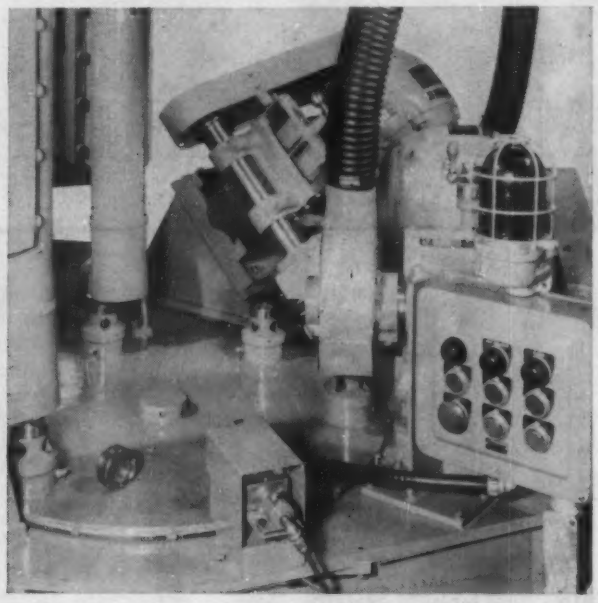




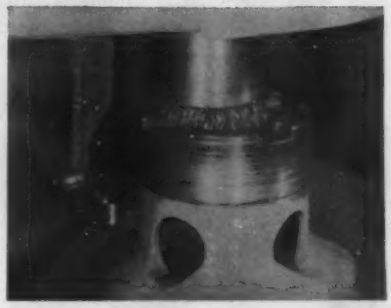
POWER HEADS ARE POSITIONED to attack burr conditions as they occur on the part. To obtain uniform results, parts must bear against the brushes with consistent pressure. Problem, solved by proper positioning, is to remove burr without damaging other machined surfaces. Hoods above the brushes are connected to a vacuum system to carry off dry chips. Wet brushing, for other parts, would use a different setup

# Automatic Deburring Machine Developed by Fuller Brush

Designed specifically for deburring parts of an automatic transmission made by an automotive manufacturer, the machine shown is typical of equipment now available for automatic deburring. Because the line producing these components is highly automated, it is necessary to get positive deburring timed to an exact cycle relative to the rest of the line. Following this concept, the manufacturer claims, brush deburring has important applications in production as a standard operation, in the same sense that operations such as turning, milling, drilling, and broaching are standard.

The machine shown processes 200 pc per hr of this clutch part. The Fullanchor brushes are 8-in. dia and rotate at 3000 rpm, each driven by a 1-hp motor. Brushes bear against the work with a penetration (chip) of 0.060 in. The indexing table is automatic, requiring only that the operator load and remove the part from an expanding collet. Table rotation is automatic, stopping at each station, positioning the chucked part to the brushes for a predetermined time, and maintaining the cycle. Brushes are adjusted to compensate for wear by turning handwheels at each station. Even loading and unloading can be automated to complete the line.

Fuller recommends the machines be tooled for a specific job. Many materials are available for use in deburring brushes, depending upon the application: stainless wire; oil-tempered, carbon-steel wire; bronze; synthetic bristles; or fibrous bristles. Selection of brush material, together with timing, brush speed, penetration, and brush positioning are important to the success of the operation. Tooling assistance is available.



BRUSH SPREAD, again to prevent damage to finished inside wall, is controlled by adjustable sleeve which confines the wire. Roller-contact switch under arm determines presence or absence of part in collet; prevents head from operating if spindle is empty

*Machine Division, The Fuller Brush Company, Hartford 2, Conn*

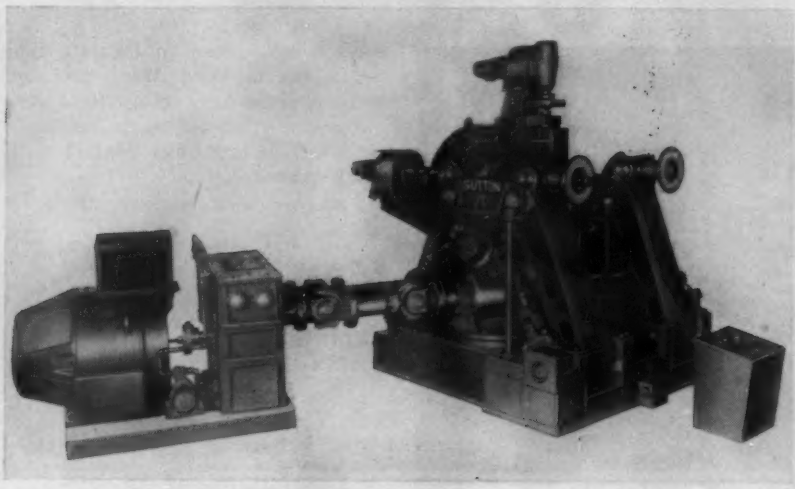
BROACH BURRS are removed from OD of part using brush at an angle. Thus, deburring is accomplished without breaking down sharp corners

## Lewis-Shepard Truck Has Winch Attachment

MultiMaster electric fork truck has 1325-lb removable counterweight which, installed at rear of truck, gives truck capacity of 4000 lb at 48-in. load length. With counterweight removed, truck has capacity of 2000 lb.

Winch attachment is for use in crowded areas where loads must be pulled horizontally. Cable is attached to bottom of the mast, runs over a pulley on the forks, down around a pulley at bottom of the mast, and out to the hook. Winch is operated by raising the forks. Raising forks only 30 in. causes hook to travel 60 in.

*Lewis-Shepard Products, Inc, Watertown, Mass*



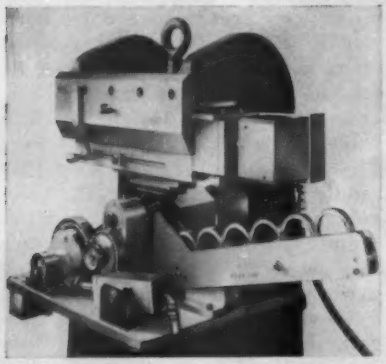
## Sutton 7-Roll Straightener Has Cluster-Roll Arrangement

7-roll straightening machine, model 4KTC, straightens upset tubing, casing and drill pipe from 20 to 50 times faster than conventional machines, according to manufacturer. Various models are available for different size ranges of material.

Standard on all machines is a cluster-roll arrangement which reportedly introduces minimum amount of stress in work, confines work positively to pass-line, and achieves superior degree of end-to-end straightness. Large driven roll with two opposed idler rolls is located at entry end of machine and another identical cluster is at delivery end. In these clusters, rolls are positioned at 120° to each other. Unopposed pressure roll is located between the two 3-roll clusters.

All models are guideless, practically automatic, and speedily adaptable for various sizes.

*Sutton Engineering Co, First National Bank Bldg, Pittsburgh 22, Pa*



## Machine Marks Bearing Races At Rate of 2500 Per Hour

Designed to roll identification on peripheries of bearing races, custom-built machine performs at rate of 1500 to 2500 per hour. Parts are fed to chute from turret lathe, picked up, placed on arbor, marked, and dropped into discharge chute.

Cycle is timed by Geneva motion actuated by hydraulic system. Timing reportedly prevents jams at marking station.

*Geo T Schmidt, Inc, 4100 Ravenswood Ave, Chicago, Ill*

## Air Filtration Process Uses Special Filter Aid

Ultra-filtration is designation of process announced by Wheelabrator for cleaning atmospheric air with industrial-type air filtration equipment. According to company, process may be used in applications formerly employing disposable or viscous filters or low-voltage electrostatic precipitators, with resulting advantages of high cleaning efficiency, moderate cost, and low maintenance expense.

Process employs conventional Wheelabrator Dustube dust collectors of tubular cloth filter type. Filter bags are charged with a filter aid which precoats the filtering surfaces and provides a matrix upon which fine particles of atmospheric dust and tarry matter are collected. One application of filter aid is said to last from 2 to 3 years under normal conditions. Only maintenance required is shaking spent filter aid and accumulated dust from the filter bags.

Typical installation which employed process had filtration unit with design volume of 720,000 cfm of city air; process reduced dust content of air from 5.21 to 0.04 mgs per 1000 cu ft (average value over a period of one year).

*Wheelabrator Corp, 1140 S Byrkit St, Mishawaka, Ind*

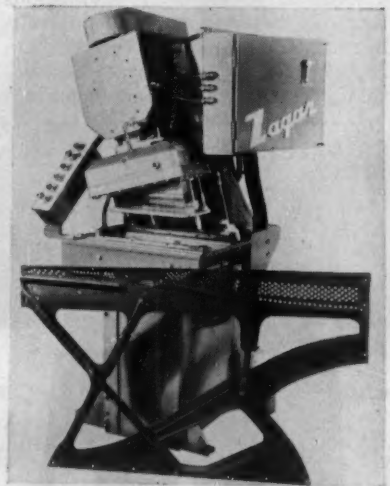
## Two New Carbide Grades Added to Carmet Line

Two steel cutting carbide grades have been developed to give greater edge wear without loss of shock resistance.

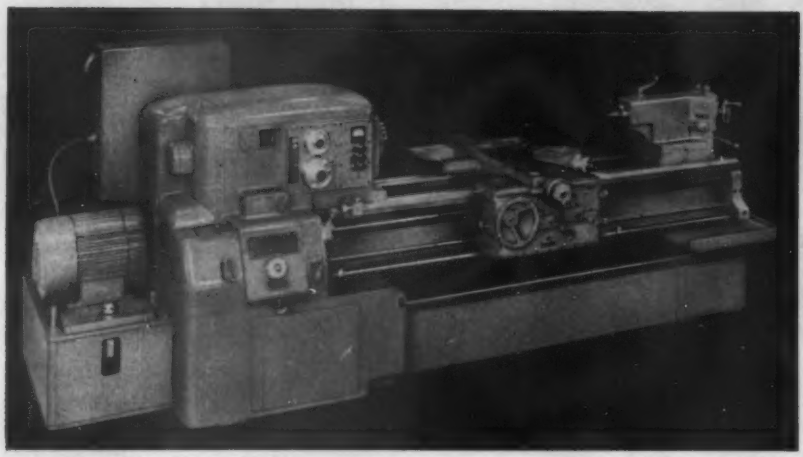
CA-606 is designed for medium heavy machining where cuts are in excess of 1/16 of an inch and where application requires more resistance to wear. CA-609 reportedly has high resistance to edge wear as well as greater resistance to heat; it is especially recommended where machining tolerances must be held.

Both grades are made with Crystalloy, the anti-cratering ingredient. Available in all standard tips and tools; can be made into special blanks of any shape or size required.

*Carmet Div, Allegheny Ludlum Steel Corp, Pittsburgh 22, Pa*



40 PIANO PLATE HOLES 0.093 in. in diameter, are drilled simultaneously with Zagar gearless drillhead designed for handling awkwardly - shaped pieces. Cycle is fully automatic; clamping is by air with cam action in case of air failure. Holes are on an angle of 14°. Spacing between centers varies from ¼ to ⅜ in. — *Zagar Tool, Inc, 24000 Lakeland Blvd, Cleveland 23, Ohio*



## Monarch Announces Eight New Series 62 Dyna-Shift Lathes

Eight additional models expand Series 62 lathes to 12 different machines. Each lathe is equipped with Monarch Preselector Dyna-Shift headstock, which permits operator to obtain automatically the correct spindle speed at which to operate by setting only one dial on headstock control panel. Preselector dial may be set for next cut on work while lathe is operating. When spindle is stopped for adjustment of tool for next cut, headstock gears automatically shift to the preselected speed.

Surface speed dial is provided so that spindle speeds may be selected directly from diameter calibrations mounted adjacent to the rpm calibrations on the preselector dial. On repetitive work, adjustable preselectors carrying individual operation numbers can be set at the correct speeds for successive cuts.

36 spindle speeds ranging from 14 to 1750 rpm are available on each lathe, with power to headstock transmitted through multiple V-belts. All electrical controls are placed at front of headstock.

Carriage and cross slide of lathes feature 4-way power rapid traverse. Headstock spindle has American Standard 6-in. type D-1 camlock nose.

Four lathes added to line have 10-hp motors; remaining four have 20-hp motors. Complete line of 12 models has clearance diameters ranging from 16 to 28 in., swing over cross slide ranging from 10 to 19 in.

*Monarch Machine Tool Co, Sidney, Ohio*

### Motor-Driven Micrometer For Small Parts

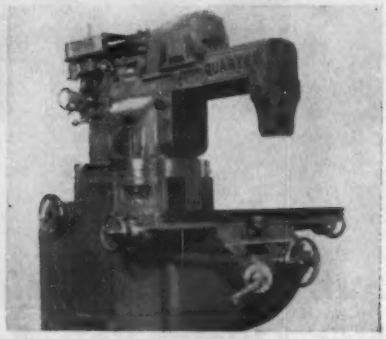
Model H electronically-controlled precision micrometer is reported accurate to 0.00005 in. Dimensions of any electrically-conductive part are read directly on 3-in. dial with dial divisions for each 0.0001 in.

Operation is automatic: operator pushes button; built-in motor brings micrometer to point of contact with work at high speed; upon contact, dial drive stops instantaneously, and reading is held until operator releases button; when button is released, motor backs micrometer away from work about 0.001 in. Electronic circuit controlling motor drive is said to sense instant of physical contact between micrometer tip and work within five-millionths in. Control is so sensitive and rapid in response that micrometer is stopped before any pressure is exerted by micrometer tip on work.

Range of micrometer screw is 1 in.; with standard micrometer tip, measuring range is ¾ in. Instrument is 9½ in. high, 8 in. deep, and 5¼ in. wide, and operates on 115-v, 60-cycle power.

System of signal lights flashes yellow when instrument is set to receive work, green to indicate that setting is completed. When over-size work is presented, yellow light goes out and micrometer tip is automatically driven up until contact with work is broken.

*J W Dice Co, Englewood, NJ*



### Milling Machine Has Indexable Spindle

U. S. Burke's Quartet is universal miller which may be used for horizontal, vertical, and angular milling operations. Machine weighs 4500 lb, has 30-in. horizontal travel, 11-in. cross travel, and 16¼-in. vertical travel.

Horizontal spindle, rather than saddle and table, indexes for universal operations on the machine. Spindle is mounted in a turret which may be swiveled 360° by means of a worm and worm wheel. Used as a universal horizontal miller, machine is arranged so that the spindle is indexed to the required angle, rather than swiveling the saddle.

Horizontal spindle has a No. 40 or No. 50 taper and is driven by a 3-hp or 5-hp motor. Independently-operated power-feed vertical head is driven by a 1½-hp motor mounted on the rectangular overarm. Horizontal spindle speeds are infinitely variable from 29 to 1450 rpm.

*U S Burke Machine Tool Div, Brotherton Rd, Cincinnati, Ohio*

### Radial Drills Have Flame-hardened Columns

Cincinnati Gilbert radial drills have large-size, flame-hardened columns on 9 and 11-in. models. 5-ft columns were finish turned, then flame hardened to Rockwell C 52-56 for a depth of 1/16 to 3/32 in, and finally finish ground to close tolerances for straightness, roundness, and high finish.

*Cincinnati Gilbert Machine Tool Co, 3366 Beekman St, Cincinnati 23, Ohio*

# Taps Without a Name

These nameless taps have been closely controlled at every operation back to where they were cut off as blanks from a steel bar.

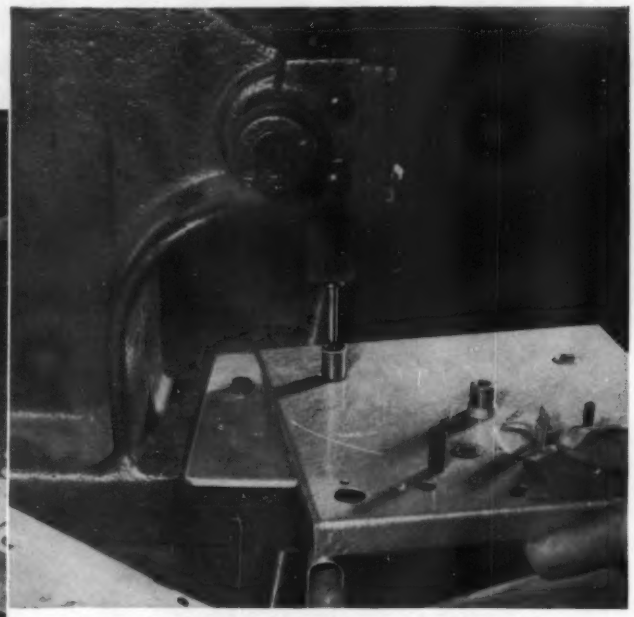
They should be, and probably are, perfect, *but* before they earn the right to bear the trade mark GTD they must pass this last test. The one on the lead tester already has passed within the plus or minus five ten-thousandths of an inch specified for one inch length of thread.

It'll do a good job for somebody! Maybe *you!*

**GREENFIELD TAP and DIE CORPORATION**

Greenfield, Massachusetts

Johnson Ledaloyl self-lubricating bearings hold oil like a sponge—will never need oiling for the life of Telectro tape recorders. Here one is being slipped on to the shaft of component.



Accuracy of Ledaloyl bearings makes for snug press-fit in the base plate of Telectro recorder.

A handful of trouble-free service for Telectro—Johnson Ledaloyl bearings assure durability of recorder, yet are economical and easy to install.

# For Accuracy, Durability And Economy, Telectro Industries Uses Johnson Ledaloyl Self-Lubricating Bearings

Telectro Industries Corporation of Long Island City, New York, insists that every component of their wire and tape recorders must have the quality and stamina to give trouble-free service for the life of the machine.

That is why they chose Johnson Ledaloyl bearings according to Mr. Roy Yasen, Purchasing Agent, who says: "Everything considered—accuracy, price and delivery—we find these self-lubricating bearings to be the most durable in this price range." "People who buy these recorders won't be bothered with taking them apart to oil bearings," continues Mr. Yasen, "that's why we use Johnson Ledaloyl bearings, that have the oil right in them. They last as long as the machines, without lubrication."

A Johnson distributor services Telectro, gives them immediate delivery on stock sizes, calls in a Johnson field engineer to help work out any special items.

Your local Johnson distributor has available more than 400 stock sizes in three basic types—he will be glad to work with you in developing new economy and performance in the items you manufacture. Johnson Bronze Company, 515 South Mill Street, New Castle, Pennsylvania.

## Johnson Bearings

GRAPHITED
over 175 sizes

GENERAL PURPOSE
over 900 sizes

UNIVERSAL BRONZE BARS
over 400 sizes

LEDALOYL
over 400 sizes

ELECTRIC MOTOR
over 350 sizes

# FYI

## FOR YOUR INFORMATION

### *FREE Catalogs, Booklets, Charts, Calculators*

**FYI** – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

### MACHINES AND ATTACHMENTS

**1** THREAD GRINDERS—*Ex-Cell-O Corp, Detroit 32, Mich.* 7-page bulletin 481051 presents illustrated information on Styles 33 and 33-L high-production automatic units for grinding external threads. Both models handle work up to 6-in.-dia. Construction features, specifications included.

**2** KELLER MACHINE — *Pratt & Whitney, West Hartford, Conn.* 5-page circular 588 describes BL 3622 Model C with single, full-range spindle for all speeds—30 to 3600 rpm in 20 steps; faster tracer response through a new electronic control of machine motions; travel speeds and feeds; optional rapid traverse; power-driven chip conveyor.

**3** DOUBLE-ACTION STRAIGHT SIDE PRESSES—*Danly Machine Specialties, Inc, Chicago 50, Ill.* 28-page illustrated catalog describes Series D units from 200 to 2000-ton capacity. Engineering details in graph form; specifications, features illustrated; auxiliary equipment listed.

**4** MACHINE TOOLS—*Springfield Machine Tool Co, Springfield, Ohio.* Four 8-page illustrated catalogs—No. 204 covers engine and toolroom lathes; 205, vertical universal grinders; 201, Model 250 16-speed lathes; 197, grinders. Application setups, operational details, specifications and accessories included.

**5** TAPE-CONTROLLED POSITIONING TABLE—*Arter Grinding Machine Co, Worcester, Mass.* 4-page bulletin gives illustrated description of automatic Jigmatic adaptable to all 4-ft or larger radial drills.

**6** TUBULAR BENDING MACHINE—*Paul Machine Tool & Die Works, Chicago 32, Ill.* 4-page folder describes low-priced Bend-Ex automatic Model A powered by air cylinder; makes 10 bends in single tube; can produce up to 1000 bends per hr. Construction and operational features illustrated.

**7** RED RING GEAR CHECKING MACHINES—*National Broach & Machine Co, Detroit 18, Mich.* 16-page catalog C55-9 presents illustrated description of machines and equipment. Capacity tables included.

### TOOLS AND ACCESSORIES

**8** GRINDING WHEELS—*Peninsular Grinding Wheel Div, Abrasive & Metal Products Co, Detroit 7, Mich.* 29-page illustrated catalog 5E describes stock abrasive items for all types of grinding; includes standard wheel marking chart, wheel shapes; list and unit net prices.

**9** CARBIDE TOOLS—*Besly-Welles Corp, Beloit, Wis.* 12-page catalog 850C illustrates line. Dimensions, applications, setup and operational data included.

**10** DIAL INDICATORS AND GAGES —*Federal Products Corp, Providence 1, RI.* 24-page illustrated catalog covers complete line of low-friction, high-precision dial indicators and accessories. 48-page catalog on dail indicator gages for checking all types of dimensional conditions, contains selection information, application data.

**11** DIAMOND TOOLS—*Diamond Products, Inc, Elyria, Ohio.* Illustrations and specifications cover diamond tool and thread grinding dressers, and center cones. Tools range from single and multiple point to diamond-impregnated. Correct procedures for wheel dressing and tool reconditioning methods included.

**12** WORK-HOLDING TOOLS—*Universal Vise & Tool Co, Parma, Mich.* 10-page catalog 9155 contains illustrated information on vises for angle machining, adjustable lathe fixtures, safety work-holders for drillpresses, and other special and standard devices.

**13** LUBRICANTS — *Alpha Molykote Corp, Stamford, Conn.* 4-page illustrated bulletin 103A describes 17 types of Molykote line; gives data, with diagrams, on applications. Covers five new lubricants. Selector chart outlines pertinent information on preferable temp ranges, etc.

**14** ABRASIVE DISKS & CYLINDER WHEELS—*Gardner Machine Co, Beloit, Wis.* 20-page catalog AC-55 contains illustrated information on complete

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line. Chart shows variable factors involved in selection; describes types and sizes of abrasives to meet variety of flat surface grinding requirements.

**15** WORK CLAMPING ASSEMBLIES —*Jergens Tool Specialty Co, Cleveland, Ohio.* 4-page folder illustrates new strap clamping principle. Twelve complete assemblies illustrated, available in a range of sizes for every application from miniature to big machine tool jobs.

**16** GRANITE SURFACE PLATES—*Collins Microflat Co, Los Angeles 21, Calif.* 67-page illustrated technical manual on Microflat black granite plates and precision inspection accessories.

## HEAT TREATING AND WELDING

**17** HIGH VACUUM FURNACES—*High Vacuum Equipment Corp, Hingham, Mass.* 8-page catalog 552 describes and illustrates units for melting, heat treating, sintering, etc, of metals and alloys. Process features explained.

**18** ELECTRIC RESISTANCE WELDING—*Sciaky Bros, Chicago 38, Ill.* 12-page bulletin 333—general machine catalog—covers industrial applications, manufacture and service, operation principles, and types of machines.

**19** $CO_2$ WELDING — *Air Reduction Sales Co, New York 17, NY.* 12-page article, "Carbon-Dioxide-Shielded Consumable-Electrode Arc Welding," deals with methods of supplying and the flow characteristics and chemical activity of carbon dioxide, properties of weld metal, operating characteristics, and specific applications.

## PLANT SERVICE EQUIPMENT

**20** MATERIALS HANDLING EQUIPMENT—*Syntron Co, Homer City, Pa.* 50-page condensed catalog 5510 contains technical data, description, photos of vibratory equipment, feeders, conveyors, power tools, shaft seals, electric hammers, and similar equipment.

**21** CHIP HANDLING & OIL RECLAMATION SYSTEM—*National Conveyors Co, Fairview, NJ.* 8-page catalog C-56 gives illustrated descriptive information on how to handle metal chips and borings, reclaim cutting oil. Applications and installations pictured and described.

**22** WET PROCESS TUMBLING BARRELS—*Tumb-L-Matic, Inc, New York 70, NY.* Bulletin XL-55 illustrates and describes Type XL units for finishing operations. Contains recommendations for selecting specific chip media and suitable compounds. Data on barrel sizes, drives, controls, liners, and optional equipment.

**23** DUST & VAPOR COLLECTING EQUIPMENT—*Aget Manufacturing Co, Adrian, Mich.* Bulletin 636-3 gives engineering information on Dustkop dust control, its installation, operation, maintenance. Range of models for every application covered. Bulletin 622-3 presents data on Mistkop vapor collector.

**24** TRAMRAIL OVERHEAD EQUIPMENT—*Cleveland Tramrail Div, Cleveland Crane & Engineering Co, Wickliffe, Ohio.* 9-page booklet 2008-L provides engineering and application data on variety of installations for materials handling. Includes analysis of stresses in a number of types of overhead tracks; describes and illustrates variety of cranes, electrification, buckets and grabs, etc.

**25** FLOOR TRUCKS—*Nutting Truck & Caster Co, Faribault, Minn.* 12-page catalog 56G illustrates 49 different models of two-wheel and platform trucks, 112 types of dollies, 15 styles of casters, as well as application of balance style trucks to trailer-train operation.

## PARTS AND MATERIALS

**26** BERYLLIUM EXTRUSION ITEMS —*Beryllium Corp, Reading, Pa.* 20-page directory lists and describes complete line of alloys and products. Includes rod and bar stock, seamless beryllium-copper tubing in redraw sizes and extruded shapes available in commercial quantities.

**27** MOTORS—*Howell Electric Motors Co, Howell, Mich.* 16-page illustrated bulletin N-100-R describes Series 100, smaller, lighter, cooler-running rerated units. Covers totally enclosed fan-cooled and open drip-proof types with new cooling system.

**28** COPPER BASE ALLOYS IN ROD FORM—*Mueller Brass Co, Port Huron, Mich.* 28-page engineering manual contains detailed information on range, from standard free-cutting variety to many special alloys. Covers chemical composition, mechanical and physical properties, machinability ratings, suitability to various fabricating processes and end uses.

**29** REINFORCED PLASTIC — *Scotchply Reinforced Plastic Div, Minnesota Mining & Mfg Co, St Paul 6, Minn.* 20-page reference manual describes advantages and procedures for use. Variety of applications illustrated; covers machining and handling, molding, sanding, grinding, sawing, etc. Includes property charts and pricing data.

**30** VALVE SELECTION CHART — *Hoke, Inc, Englewood, NJ.* 18 x 24-in. wall chart provides tabular data on V-point and blunt point needle valves, as well as spring closing and cam closing toggle valves available in forged body or bar stock designs. Includes corrosion resistance table and formulae for proper method of sizing based on max flow desired.

**31** METAL POWDERS—*Metal Powder Association, New York 17, NY.* 4-page Data Sheet No. 4 lists and correlates all commercially available standards, specifications, and other references on powders and metal powder products. Official designations listed, together with pertinent differences between standards issued by different organizations.

**32** DIE SPRINGS — *Die Supply Div, E W Bliss Co, Cleveland 9, Ohio.* 12-page brochure 72 illustrates and describes complete line in three pressure groups and 500 standard sizes. Performance data, specifications, application, and dimensions included.

**33** SYNCLINAL FILTERS — *Marvel Engineering Co, Chicago, Ill.* 10-page illustrated catalog 106 gives data on both sump and line-type units for hydraulic oils, coolants, and lubricants. Dimensional charts, applications, flow and pressure drop table provided.

# Set them, forget them—they stay tight

# New high-torque Unbrako self-locking socket set screws

Research has proved that the tighter you seat a set screw the better it works. So we designed a set screw that can be tightened tighter than ever before. We formed a deeper socket. We put a radius in the socket corner. We developed fully formed threads. We established new methods of heat treatment in atmosphere-controlled furnaces. All this, plus the well-known self-locking knurled cup point that keeps it tight.

Let's see what the changes in the UNBRAKO socket mean to you. The deeper socket gives you more purchase with the wrench. Since more wrench can be put in the socket, you can tighten the screw much tighter. And you won't ream the socket or round the corners of the wrench. The radius in the UNBRAKO corners eliminates the sharp corners where cracks start. Ordinary socket screws have sharp corners which often crack even at torques much lower than those recommended for UNBRAKOS.

You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

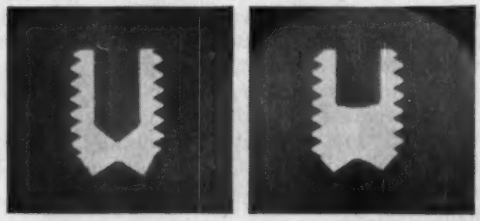
*Up to 40% higher tightening torque— a new Unbrako feature*

**RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)**

| SCREW SIZE | UNBRAKO | SET SCREW B | SET SCREW C | MINIMUM DIFFERENTIAL % |
|---|---|---|---|---|
| #4 | 5 | 3.9 | 3.5 | 28 |
| #5 | 9 | 7.8 | 7.4 | 15 |
| #6 | 9 | 7.8 | 7.4 | 15 |
| #8 | 20 | 14.7 | 14.5 | 36 |
| #10 | 33 | 26.5 | 25 | 25 |
| 1/4 | 87 | 62 | 60 | 40 |
| 5/16 | 165 | 122 | 125 | 32 |
| 3/8 | 290 | 198 | 225 | 29 |
| 7/16 | 430 | 309 | 350 | 23 |
| 1/2 | 620 | 460 | 500 | 24 |
| 5/8 | 1225 | 1106 | 1060 | 11 |
| 3/4 | 2125 | 1540 | 1800 | 18 |
| 7/8 | 5000 | 3660 | 4600 | 9 |
| 1 | 7000 | 5025 | 6500 | 8 |

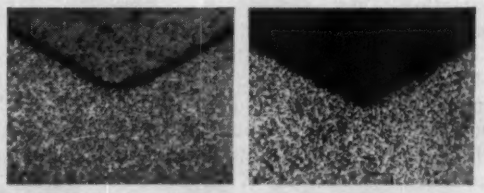
**ALL UNBRAKOs** can withstand higher tightening torques than ordinary socket set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary socket set screw.

**Unbrako Set Screw** **Ordinary Set Screw**



**COMPARE** the socket depth. The UNBRAKO socket at the left is much deeper than the socket in the ordinary set screw at the right. This additional depth in the UNBRAKO socket gives you more purchase with the wrench—you can set an UNBRAKO much tighter.

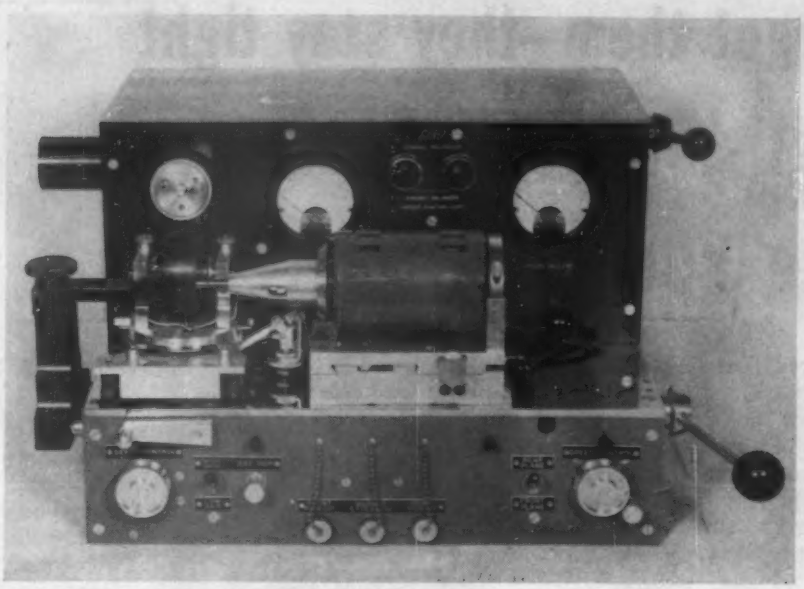
**Unbrako Set Screw** **Ordinary Set Screw**



**THE RADIUS** put in UNBRAKO socket corners eliminates the sharp corners where cracks start. They distribute the stresses developed when tightening torques are applied. You can seat an UNBRAKO tighter without screw failure. Ordinary set screws have sharp corners which often crack when tightened even at lower recommended torques.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA



## Decker Dynamic Balancer Sensitive to 0.00001 Inch-Ounce

With Decker T-42 gas-discharge transducer, a relatively simple device will locate, measure, and correct dynamic unbalance in high-speed rotors and similar components to better than 0.00001 in.-oz on a production basis. For rapid balancing procedures, this machines has been designed to permit the complete operation without removing the rotor from the mount. All rotors up to 4-in. shaft length and 4-in. dia may be handled in this manner. Larger rotors are separately mounted and connected to the apparatus through external plug-in jacks. All rotor mounts are designed for fast work changeover.

Auxiliary friction drive from a high-speed motor provides rapid acceleration to balancing speed—as fast as 6 sec—then the electrical drive coupled with the speed control takes over. All effects from speed variations are eliminated during balancing, it is said.

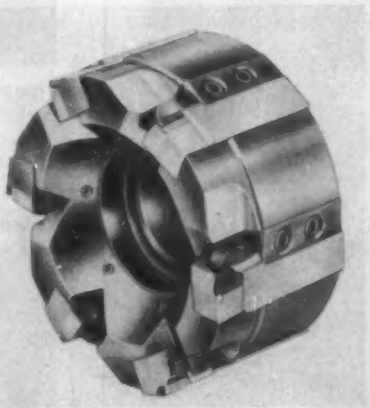
Removal of as little as 0.000001 oz of material is permitted by a high-speed, metered, precision drill, without dismounting the rotor. Also included in the design are automatic location and marking of the point of unbalance.

Thus, this design is intended for shop operation with a minimum of special skill or experience.

Dynamic balancing is performed at a rotational speed of 10,380 rpm. Automatic control maintains this speed to better than 0.1%. This frequency of rotation during balancing minimizes interference from bearing noise, 60 cps, 400cps, and 1000 cps excitation voltages, and their harmonics. Other balancing speeds and adapters for air-driven rotors are available on special order. A primarily electronic system is used for location and measurement of unbalance. Electro-mechanical components are minimized. According to the manufacturer, this design leads to maximum reliability, and ease of maintenance and calibration.

*Decker Aviation Corp, 1361 Frankford Ave, Philadelphia, Penna*

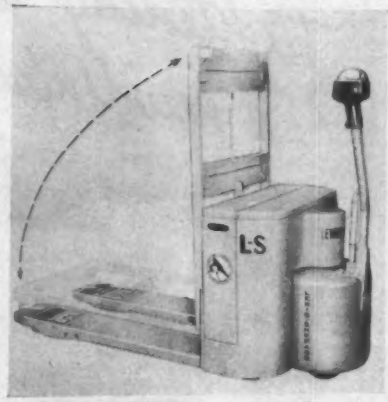
SLOTS IN VANE-TYPE REFRIGERATOR COMPRESSOR ROTORS are rough- and finish-ground on machine which produces surface finish of 5 mu-in. or less. Features include automatic diameter compensation as wheel is dressed; two-speed motor for roughing and finishing; coolant guarding arranged so that grinding is done under water; air-oil feed system which regulates rate of downfeed of the wheel. Slots ranging up to ¼-in. wide and up to inch or more deep can be ground—*Planet Products Corp, Cincinnati 27, Ohio*



### Nelco Face Mill Takes Disposable Carbide Inserts

Face mill body termed Lifetime accommodates standard holders and has built-in adjustments to take standard toolbits with throwaway carbide blanks, each blank having six cutting edges. Design permits changing of blanks in few seconds.

*Nelco Tool Co, Manchester, Conn*




### Pallet Truck Handles Skid Platforms

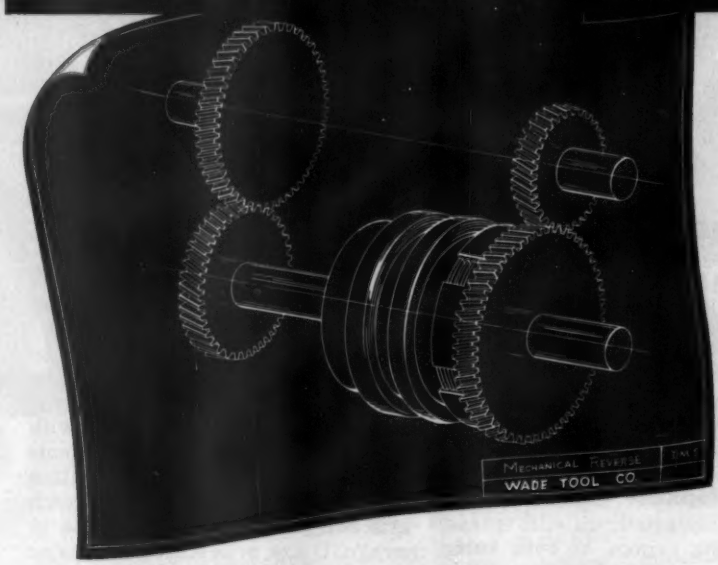
Lewis-Shepard Jacklift electric pallet truck has been equipped with a hinged superframe so that the truck can handle skid platforms as well as pallets. Used for handling skid platforms, the superframe increases the lowered height to any amount up to 11½ in. With a vertical lift of 4 in., truck can handle single or double-face pallets and skids of any underclearance.

For pallet handling, the superframe is locked, and the lowered height is 3¼ in.

Jacklift Electric, available in capacities to 6000 lb, is only 27⅞ in. longer than fork length. Drive unit is a double reduction gear drive with traction speeds of 3 MPH empty and 2.3 MPH loaded.

*Lewis-Shepard, Watertown, Mass*

# Only the Wade® HAND TURRET LATHE can give you Unlimited Reversing



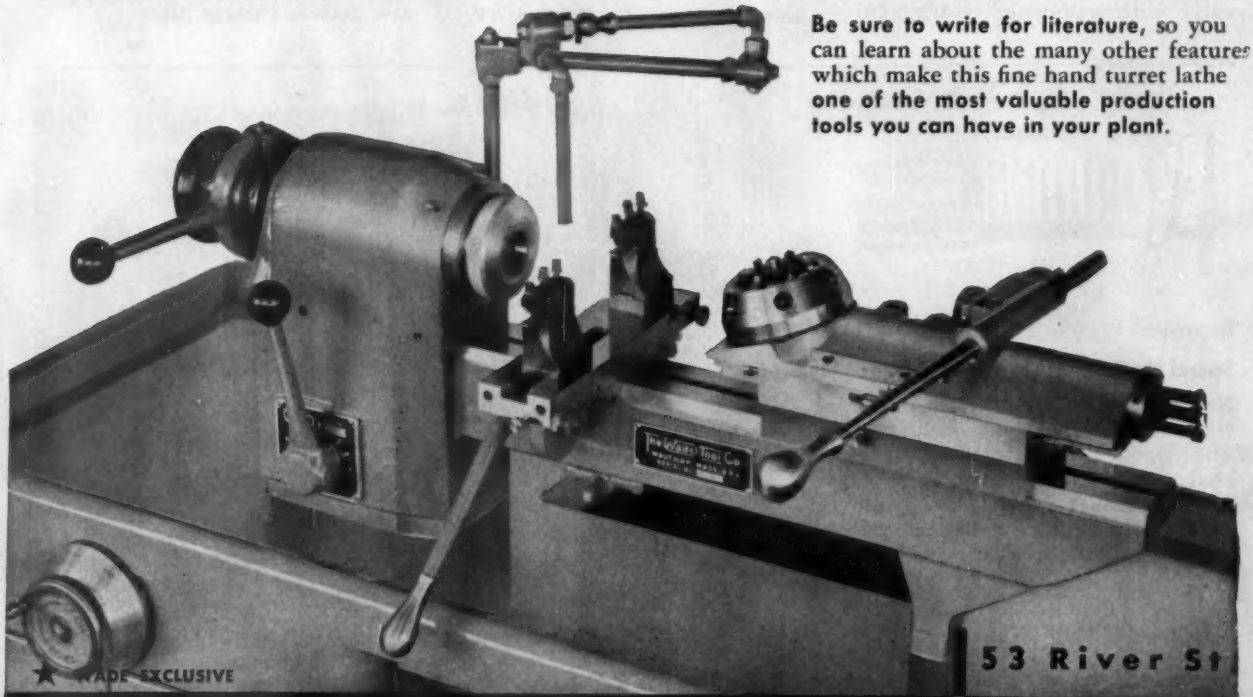

This *exclusive* Wade feature offers you amazing flexibility of operation, resulting in production possibilities obtainable from no other comparable lathe!

**A Standard Single Speed Motor** is all that is required to drive. Instantaneous Reverse and Hi-Lo are provided through gears and Infinite Speed Changes through variable pitch pulleys.

Speed ranges are from 100 to 3500 RPM, with a high-low ratio of 5-to-1 (also exclusive with WADE). Reverse ratio 2½ times the slow speed.

**no. 73 HAND TURRET LATHE**

**Be sure to write for literature,** so you can learn about the many other features which make this fine hand turret lathe **one of the most valuable production tools you can have in your plant.**



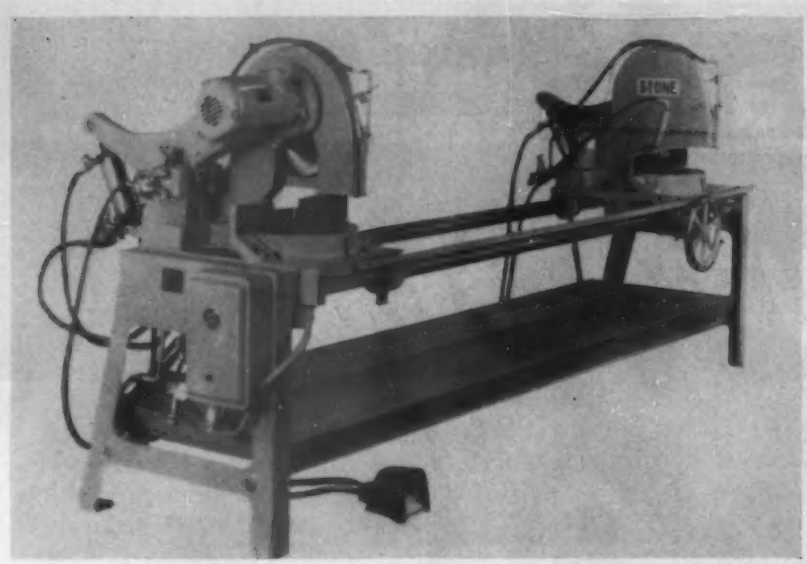
★ WADE EXCLUSIVE

53 River St

**THE WADE TOOL CO.**

WALTHAM 54, MASS. U. S. A.

MAKERS OF PRECISION MACHINE TOOLS FOR AMERICAN INDUSTRY



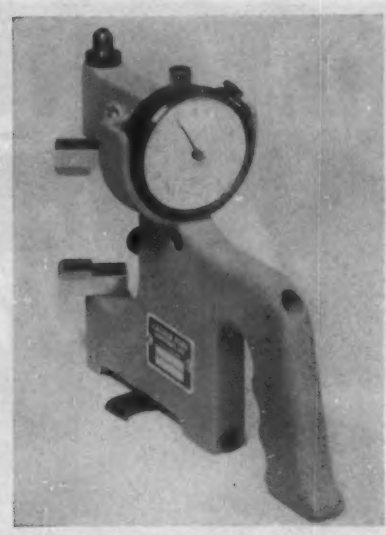

## Stone Cutting Machine Has Two Semi-Independent Heads

Model DM-352 is double-cutting machine which handles cutting lengths from 22 in. to 102 in. Designed for cutting non-ferrous metals with saw blades and ferrous metals with abrasive cutoff wheels, machine has two semi-independent heads that cut simultaneously. Either head will make 90° cuts or will cut at any degree up to 45° in either direction.

Power stroking of the cutting heads is air-actuated by a foot pedal valve with automatic return. Oil mist sprays lubricate the blades through each cut. Machine is powered by two 3½-hp induction type motors geared to 3200 rpm spindle speed. Either 12 or 14-in. blades may be used with the machine.

Standard equipment includes air pressure regulator gage, oiler and filter, two automatic oil mist sprays, and holding clamps at both kerfs. Machine requires floor space of 26 x 120 in.

*Stone Machinery Co, Manlius, NY*

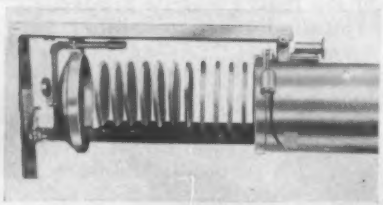


## Snap Gages in Sizes To 2.500 in.

Lincoln Park dial snap gages are supplied in sizes up to 2.500 in. in ten standard models. Gages are designed to give a direct reading from measuring anvil to indicator; there are no intermediate bearings, levers, shafts or cams.

Parallel anvils are tipped with solid cemented-carbide. Adjustments of upper anvil may be made within ¼-in. range by means of a fine-pitch attachment. Indicators, available in any AGD size, are encased in housing for protection.

*Lincoln Park Industries, 1719 Ferris Ave, Lincoln Park 25, Mich*

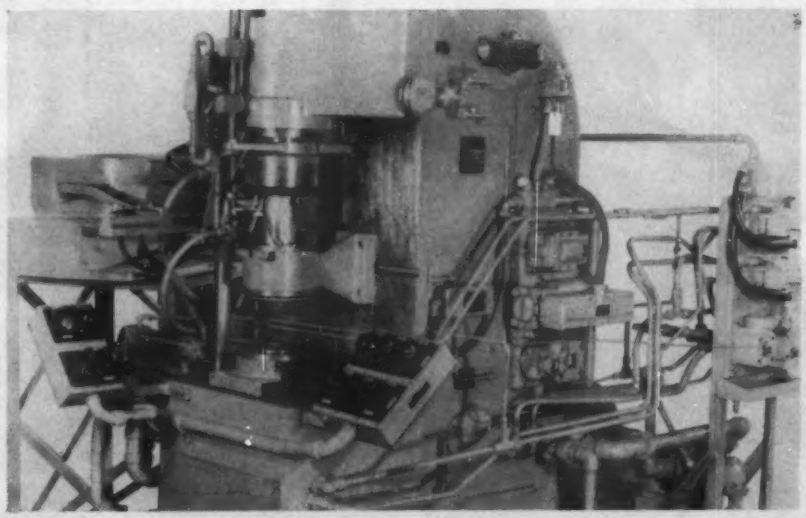


## Improved Pressure Filters Speed Up Operations

New features incorporated in Industrial horizontal filters include a quick-opening, hydraulically operated and sealed door, and filter leaves which lift out and snap back into place without bolts. Optional vibrating attachment shakes off filter cake, eliminating need for scraping or shaking by hand.

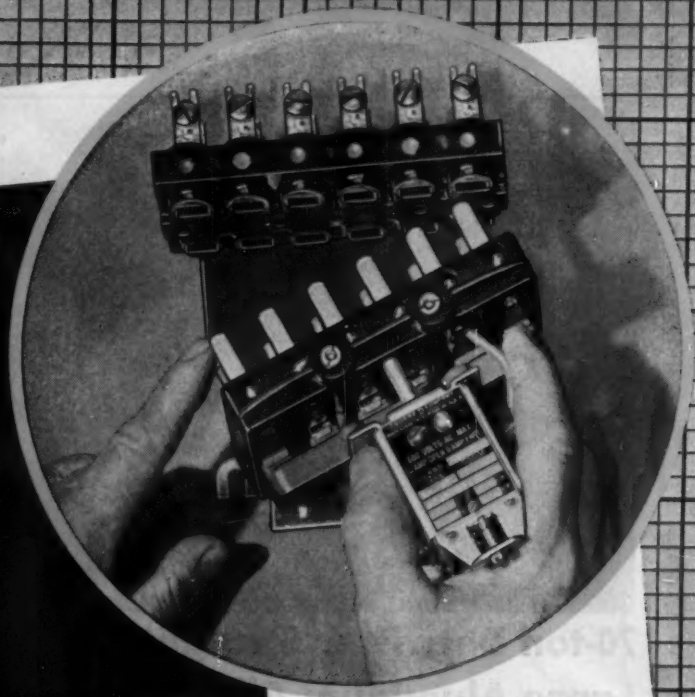
Standard features include power or manual withdrawal of leaf assembly, completely exposing all leaves; bottom outlet; air-drying facilities; and optional leaf spacing.

*Industrial Filter & Pump Mfg Co, Chicago 50, Ill*



**AMERICAN 25-TON PRESS with electrical controls automatically assembles and stakes drive flange of automotive transmission to a pinion gear and then assembles a bushing into the gear. Machine is equipped with special work base, hydraulic assembly cylinder, hydraulic loader, and hopper feed. Spiral bar and nut assembly guides flange in assembly to helical spline teeth of gear. Complete cycle for assembly of workpiece is about 17 seconds—*American Broach and Machine Co, Ann Arbor, Mich***

# *Now...* PLUG-IN RELAY FOR INDUSTRIAL SERVICE!



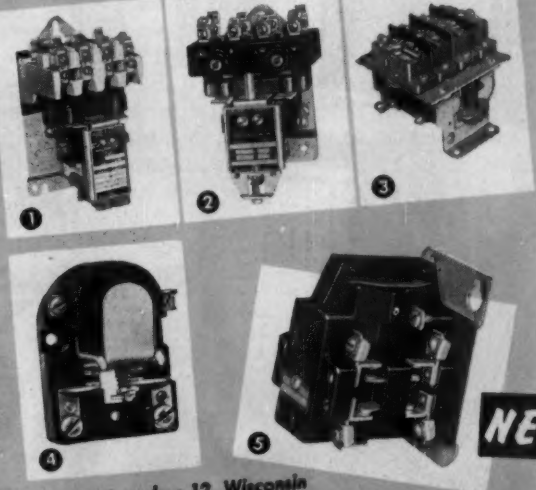
Qwik Change

• A screwdriver and five seconds are all you need to remove this new **PLUG-IN** relay for normal inspection, maintenance or replacement! That's big news in these days of "pushbutton" operations when even a few minutes of down-time can mean thousands of production dollars down the drain.

Square D Field Engineers have sensed this ever-increasing problem in their contacts with machine tool builders and industrial plants throughout the country. Square D design engineers have followed through with this, the first **plug-in** relay built specifically for machine tool use. Another example of design leadership!

## HERE ARE OTHER MEMBERS OF SQUARE D's RELAY TEAM

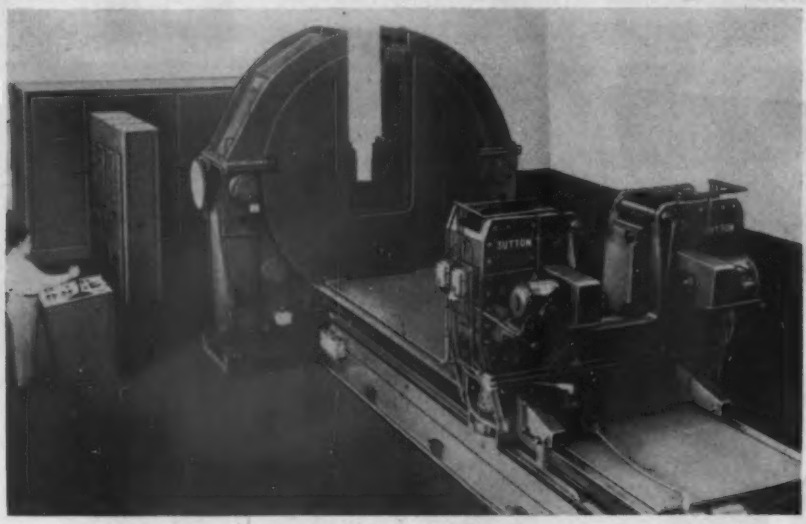
1. **TYPE B** (15 Amperes, 600 Volts) Heavy-duty construction with hardened parts for severe machine tool service
2. **TYPE A** (10 Amperes, 600 Volts) Designed for general-purpose applications involving normal operations
3. **TYPE P** (Rated 10 Amperes, 600 Volts) Totally-enclosed contacts make this type especially suitable for operations in dusty or linty locations
4. **TYPE C** Used as auxiliary devices for controlling small, single phase motors or other light loads
5. **TYPE D** (Rated 10 Amperes, 600 Volts) This new and most compact of all Square D relays is ideal for general-purpose applications involving very limited space




*Write* for Bulletin 8501
Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

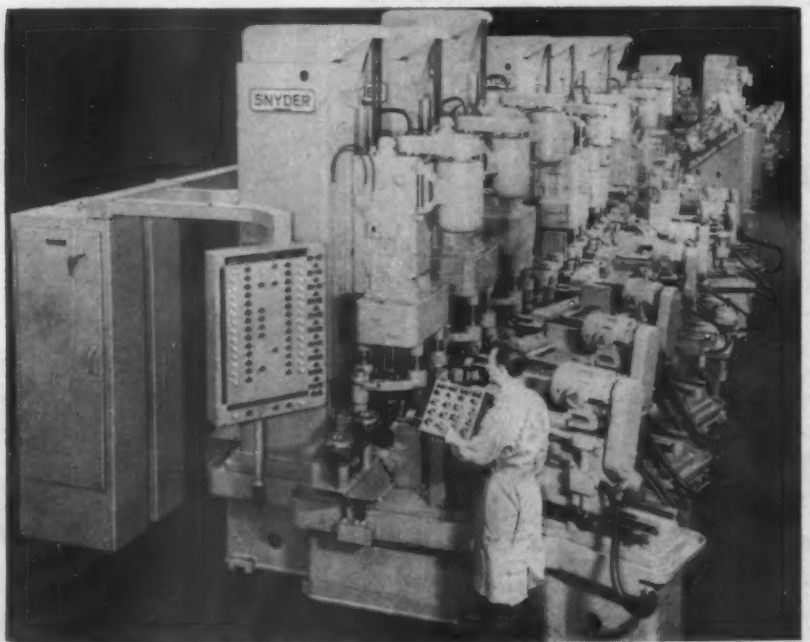


## 70-ton Detwister Straightens Large Aluminum Alloy Extrusions

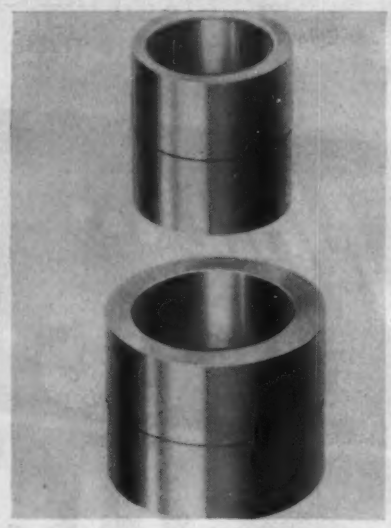
Heavy-duty Sutton machine with max torque of 3,000,000 in.-lb at 2½ rpm aligns irregular sections which can be contained within a 24-in.-dia circle in lengths up to 85 ft.

Work is lowered from the top into position between headstock and tailstock. Tailstock is motor-driven along the bed to accommodate various lengths of extruded work. Distance between heads can be varied from 3 to 20 ft. Powered by a 125-hp variable-speed motor which acts through a two-stage gear unit, headstock rotation is infinitely variable from 0 to 3 rpm. Torque is 2,500,000 in.-lb at max headstock speed. Work is clamped in place by T-slotted jaw carriers operated by ¾ hp, 430 rpm motors in head and tailstocks.

*Sutton Engineering Co, First National Bank Bldg, Pittsburgh 22, Penna*




TRANSFER MACHINE handles cast iron automotive automatic transmission front oil-pump bodies at rate of 144 pieces per hour at 80% efficiency. On 111-ft, 75-station machine, operations are performed by individual segments, each having base and slide units as well as control panels. Single transfer bar moves parts from one machine segement to the next. Design eliminates master control panel; removable segments provide quick change to adapt to new design — *Snyder Tool & Engineering Co, 3400 East Lafayette Ave, Detroit 7, Mich*

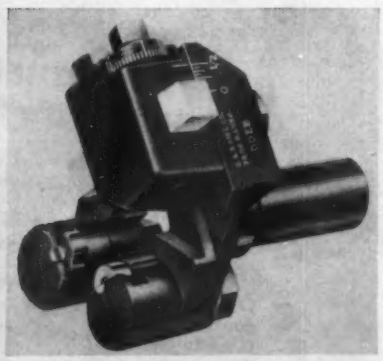


## Adjustable Interlocking Liners Give Jig Boring Accuracy

The Lee Liner is an adjustable, interlocking liner consisting of two mated eccentric parts capable of adjusting location of a hole center as much as 0.062 max. Slip fit of 0.0003 for positioning is said to assure precise, easy adjustment. After positioning, parts are pressed together with a press fit of 0.0015 in. for locking.

Applications include hole relocation in production jigs; picking up holes from a match plate or master part; tooling for short run parts.

*Lee Liner Co, 107 Sierra St, El Segundo, Calif*

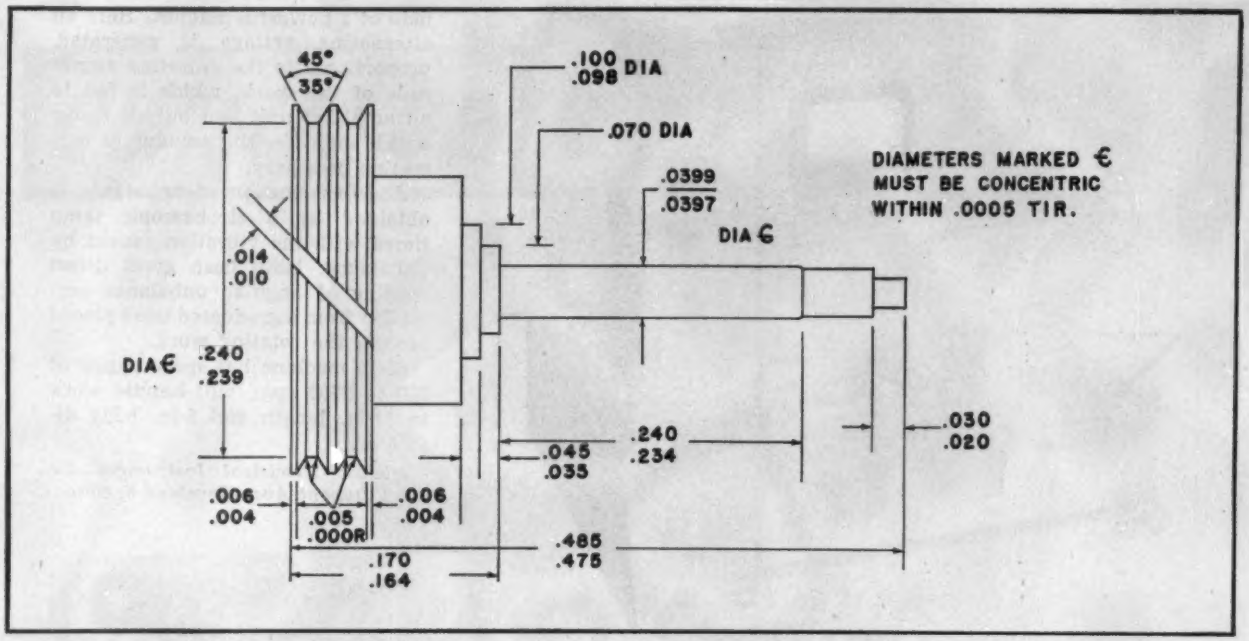


## B & S No. 00 Screw Machine Tools

Nine new or redesigned No. 00 size screw machine tools are announced. All are in ½-in. capacity. New tools are: non-releasing and releasing tapholders in floating type; thread roll holder; boring tool holder with micrometer adjustment; floating reamer holder with antifriction bearings.

Redesigned tools include box tool, balance turning tool, adjustable knurl tool holder, and universal toolpost for square tools.

*Brown & Sharpe Manufacturing Co, Providence 1, RI*




# Five times as many parts checked per day... with a Kodak Contour Projector

**Here's one company's approach to the problem of receiving inspection that may help you save time, improve accuracy.**

TECHNOLOGY INSTRUMENT CORPORATION'S receiving inspection used to require 10 to 15 minutes each to check incoming precision shafts by mechanical gaging. Inspection involved concentricity, diameters, shoulder locations, and other hard-to-measure dimensions. Tolerances on these shafts—components of precision potentiometers—ranged from .002″ to .0002″.

Then they turned to optical gaging with a Kodak Contour Projector; inspection time was cut to 2 to 3 minutes per shaft.

Here, again, is proof of how a Kodak Contour Projector often speeds inspection of precision parts. Dimensions difficult or impossible to measure by mechanical methods frequently are easily checked using optical methods. And you can shift from one part to another simply by changing a fixture and chart-gage.

There's a Kodak Contour Projector for every inspection or measurement job, whether in the toolroom, in receiving, production, or final inspection. And there's a representative in your area who can evaluate your needs for you. To get in touch with him, or for a copy of the booklet "Kodak Contour Projectors," mail the coupon below.

**the KODAK CONTOUR PROJECTOR**

90

**EASTMAN KODAK COMPANY**
**Special Products Sales Division, Rochester 4, N. Y.**

☐ Please send me a copy of your booklet "The Kodak Contour Projectors."
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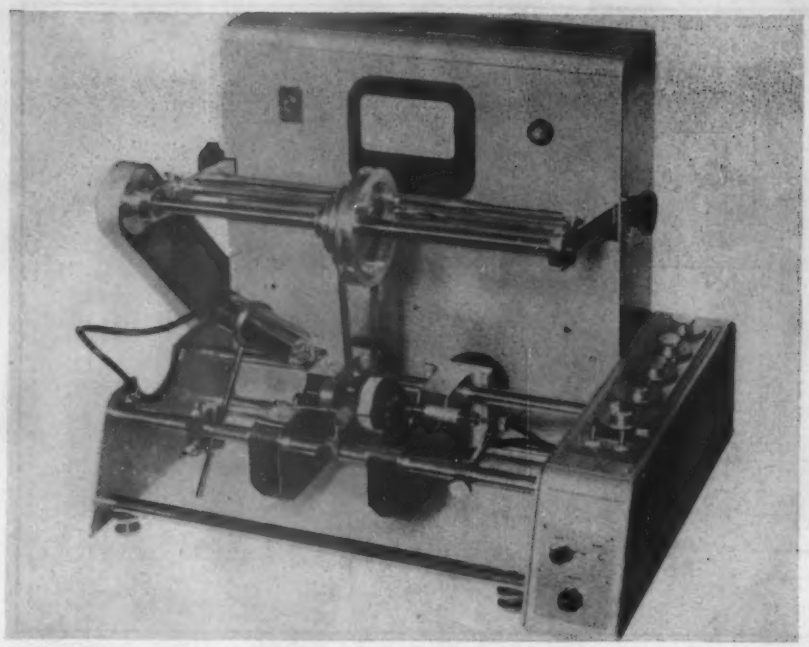


## Hickok Machine Measures Unbalance in Rotating Parts

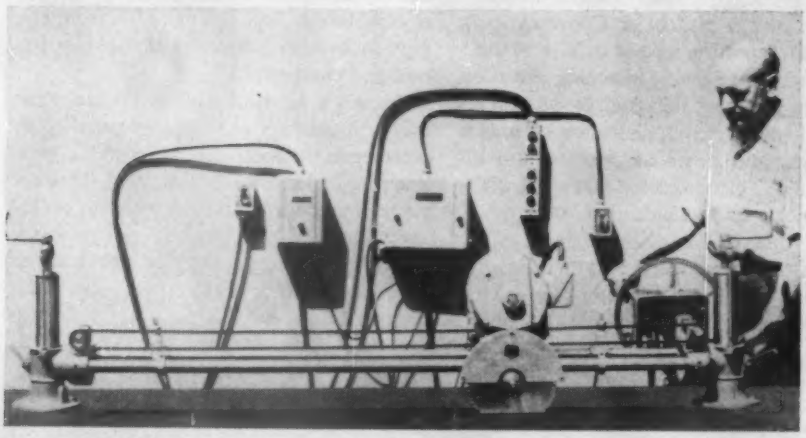
Type 1250 electronic balancing machine is designed for dynamic balancing of small cylindrical bodies, such as rotors and small armatures. Instrument shows position at which out-of-balance is situated and amount of correction needed.

Work is supported horizontally in V-mountings carried on light, adjustable cradles. With work in machine and motor running, unbalance in work will cause vibration of the supporting structure which is transmitted by rods to pickup coils in the field of a powerful magnet. Here an alternating voltage is generated, proportional to the vibration amplitude of the work, which is fed to an amplifier unit and output meter which indicates the amount of correction necessary.

Angular location of unbalance is obtained by a stroboscopic lamp timed with the vibration caused by unbalance; lamp flash gives direct reading of angular unbalance correction from a graduated band placed around the rotating work.

63-lb machine has speed range of 800 to 2700 rpm, will handle work to 11-in. length and 5-in. body diameter.

*Hickok Electrical Instrument Co, 10514 Dupont Ave, Cleveland 8, Ohio*



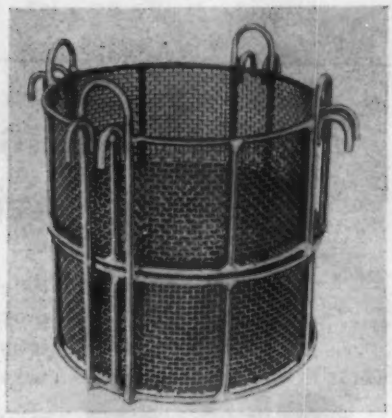
## Panel Saw Has Manual Or Automatic Control

Hendrick Model MA panel saw for sizing and trimming plywood, plastic, or metal sheet stock is available with capacities from 4½ to 12½ ft and with motors up to 3 hp. Automatic carriage speeds are infinitely variable from 8 to 50 fpm. Adjustment permits cutting on both passes, doubling production.

Manual operation, useful in cutting thick stock or in determining optimum speed prior to automatic cutting, is achieved by throwing a clutch.

Work is done in full view of operator. GE remote control stations provided with 12-ft cords afford additional safety.

*Hendrick Mfg Corp, Marblehead, Mass*



## Heat Treating Baskets Handle Small Parts

Wiretex Inconel heat treating baskets were designed for loading smaller than customary machinery parts into main basket of nitriding furnace. Baskets may be used individually or two together. Constructed of 0.120-in., 2 mesh Inconel wire, baskets have 27-in. diameter and 12-in. depth, with frame and braces of ⅝-in. rod and lifting hooks and handle of ¾-in. rod.

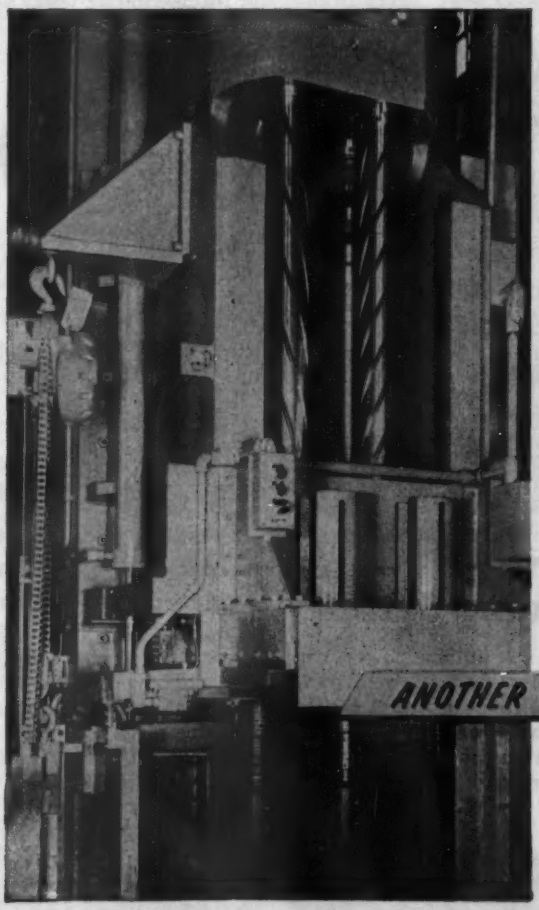
Baskets were designed in conjunction with Farrel-Birmingham Co for nitriding process using ammonia gas at temperatures up to 1000°F and cycles ranging from 45 to 180 hours.

*Wiretex Manufacturing Co, 40 Mason St, Bridgeport, Conn*

**Rustbond Primer No. 6** has drying time of 10 minutes at 85F, can be used over wirebrushed, rusty steel, sand-blasted steel, and clean cold rolled steel; compatible with a wide range of topcoats.

*Carboline Co, 331 Thornton, St Louis 19, Mo*

# QUALITY GEARS for QUIET TRANSMISSIONS



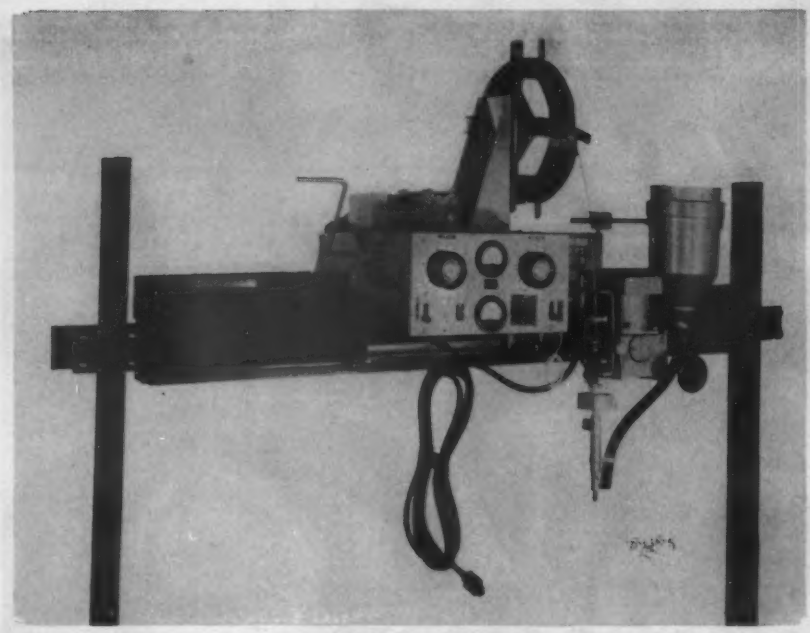
## ...broached automatically

Producing quality internal helical gear teeth is the task of two Colonial 2-station RUF-50-72 pull-up broaching machines. All gears are automatically loaded from cartridges and automatically unloaded, with the larger diameter gears being broached two at a time on each station. These quiet transmission gears with three different leads and diameters, have two left hand and one right hand spiral. All three different gears may be broached as production demands on either of the two stations.

Broaches are guided on both ends through full length of cut; broach handling is automatic with safety interlock. Colonial broaches for these gears weigh as much as 800 pounds, and are 81 inches long. Broaches return through a retractable brush and a pressure spray washes chips away. An electric hoist mounted on a universal loading arm handles these broaches in and out of the machine. A cooler for cutting oil, a magnetic chip separator, and an automatic chip conveyor are also furnished on these two Colonial pull-ups.

ANOTHER EXAMPLE OF COLONIAL UNIFIED BROACHING

COLONIAL
BROACH & MACHINE CO.
DETROIT 13, MICH.



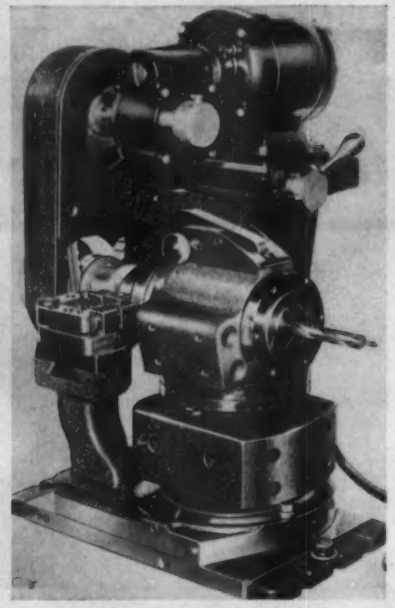
## Hobart Beam Carriage For Automatic Welding Head

Designed for use with Hobart Models ASM-5D and ASM-5T automatic welding heads, beam carriage is driven by a 110-v dc motor through a double-worm gear reduction. Set of spur gears mounted between the gear reducer output shaft and the carriage drive shaft provides two travel speed ranges: 8 to 75 ipm and 75 to 300 ipm.

Friction roll held against back rail of the beam by a spring propels the carriage on 6 permanently lubricated, sealed rollers. Crank is provided for disengaging drive roll so that carriage can be positioned manually.

Carriage can be equipped to perform submerged-arc, inert-gas, or open-arc welding. For inert-gas welding, solenoid valves control flow of gas and cooling water.

*Hobart Bros Co, Hobart Sq, Troy, Ohio*

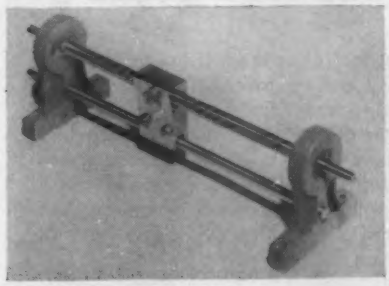


### Form-Relieving Fixture Made In Electric-Powered Model

R-O universal form-relieving fixture is motorized, for grinding a quantity of tools of the same shape. Power operation of the fixture is said to deliver constant high torque at speeds from 0 to 80 rpm.

Power is from 1/15-hp, 1725-rpm motor with 40:1 gear reducer. Said to be suitable for form-grinding taps, center drills, reamers, step-drills, and similar tools, in addition to conventional form-grinding.

*Royal Oak Tool & Machine Co, 29800 Stephenson Highway, Royal Oak, Mich*



### Lead Screw Assemblies

Precision lead screw assemblies are designed to provide a means of converting rotational motion into linear motion of carriage traveling along a shaft. Carriage can mount a pen or indicator for recording or display purposes.

Type X1-1 has 0.050 in. of movement per revolution; type X1-2 has 0.0356 in. Units have Barden precision ball bearings of ABEC-7 quality. Construction is stainless steel except for hangers, which are anodized aluminum.

*PIC Design Corp, 160 Atlantic Ave, Lynbrook, LI, NY*

## Magnetic Plate Clamp Simplifies Welding Setup

Bux magnetic plate clamp pulls edges of heavy steel plates flush, holds them securely in position for butt welding and similar work. Clamp is said to save time and materials required in preparing jigs, dogs, mechanical clamps, and fixtures as plate-holders.

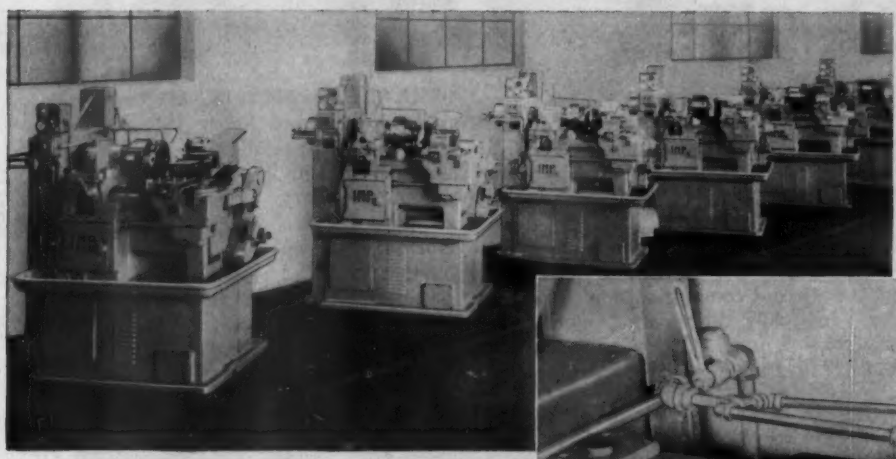
21 in. in overall height and 50 lb in weight, tool generates 3000 lb of power, can be instantly attached or removed from the job. Leverage control which forces metal surfaces into contact consists of one-piece rod and pressure stud mounted on a swivel.

Rectifier unit is contained in the post, eliminating need for external convertor units.

*Buck Mfg Co, 100 Roberts Rd, Los Gatos, Calif*

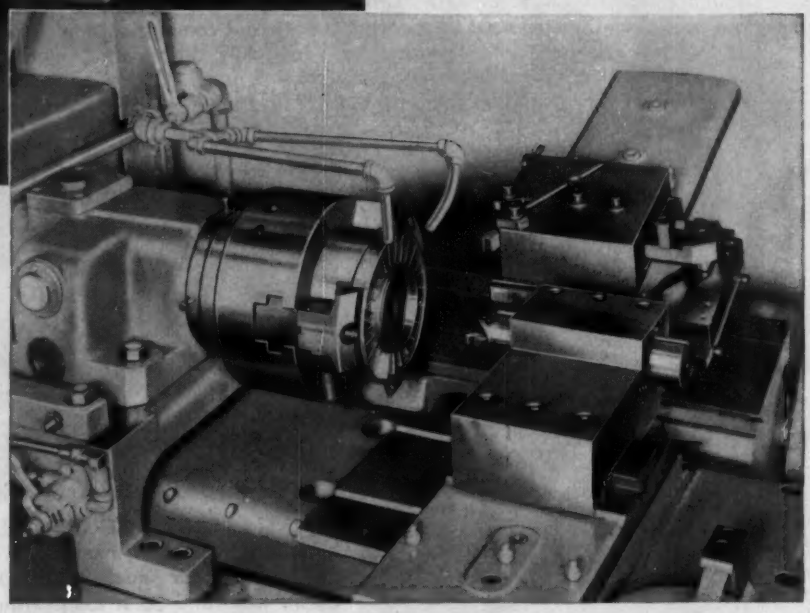
# MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



*Left: Several of a group of Lo-swing IMP's used in machining Automatic Transmission Parts.*

*Below: Close-up view of tooling.*



## AUTOMATIC TRANSMISSION PARTS MACHINED AUTOMATICALLY ON Lo-swing IMP

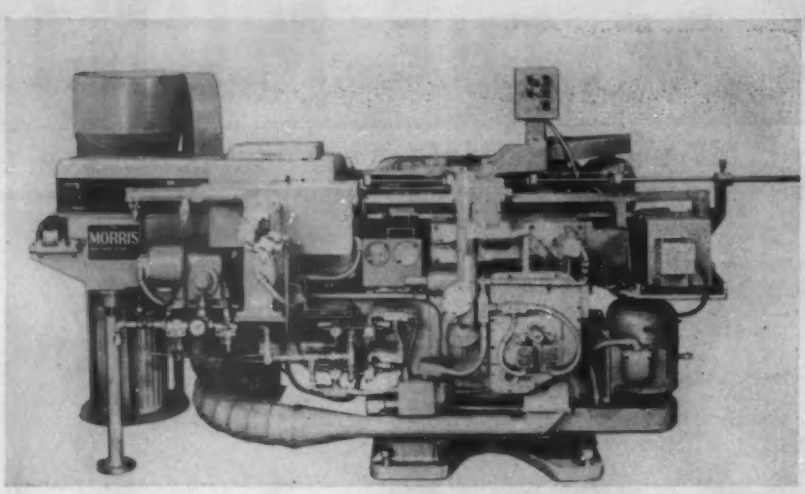
***Problem:*** **To bore and face welded Torque Converter Stator Assemblies. Parts must be held without distortion and machined within close limits.**

***Solution:*** **IMP Automatic Lo-swing Lathes were selected for this work due to ease of operation, high spindle speeds, compactness and rigidity. The upper illustration shows several of a group of machines installed for this class of work. The lower illustration shows one of the lathes, with coolant guard removed, equipped for boring and facing one of the Torque Converter Stator Assemblies. The part is held in a three-jaw, air-operated chuck fitted with wide mushroom type jaws to prevent distortion of the piece. The boring operation is made with two carbide tipped tools mounted in a boring bar and holder and fitted to the front slide. Tool relief is provided on the return stroke. The facing and trimming tools are mounted on a template controlled rear tool block which permits the facing operation to be made at the correct angle. The operation is entirely automatic, the operator simply loads and unloads the parts.**

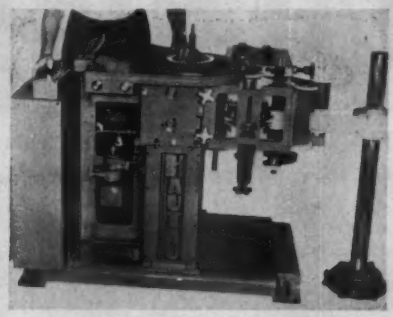
**Engineered jobs are our specialty. Our staff is at your disposal to help solve your problems.**

**SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.**

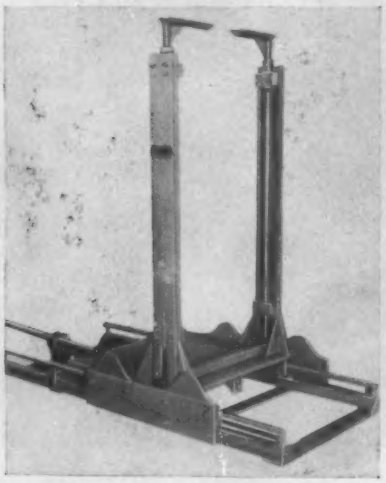
## PRODUCTION COSTS ARE LOWER WITH Lo-swing




MORRIS PISTON BALANCING MACHINE automatically receives, weighs, sorts, positions, clamps, machines, and discharges internal combustion engine pistons at rate of 720 per hour. Powered by heavy-duty 5-hp motor, machine is equipped with complete electronic-cycle control panel. Operation reportedly maintains piston weights to tolerances of ± 1 gram — *Morris Machine Tool Co, Cincinnati, Ohio*



INSULATION PAPER IS FED from a roll, formed, and inserted in motor stators in this special-purpose machine which is said to be able to accommodate motors to 30 hp. Machine is completely mechanically actuated. Electric motor powers each of the motions in timed relationship to one another. Adjustments permit handling different sizes of motors, with arrangements for changing diameter, number of slots, and depths — *Hautau Engineering Co, 721 Wanda, Ferndale, Mich*

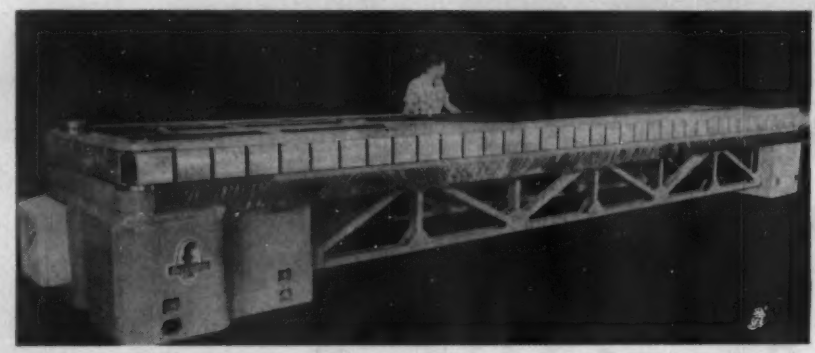


## Wagner Automatic Loader Speeds Materials Handling

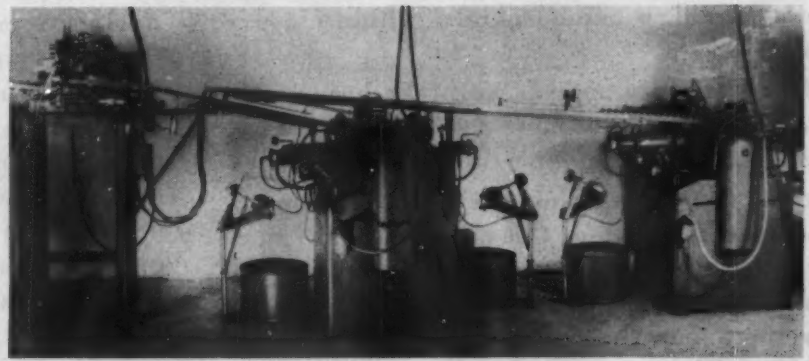
Auto-Loader, a completely automatic parts transfer mechanism, can be adapted to any automatic metal finishing mechanism operating with an intermittent motion.

All transfer mechanism is mounted on a reciprocating carriage, moving on rollers in a channel track. Cam followers attached to the lifting arms duplicate eccentric contour of the side plates to raise and lower lifting arms into loading and unloading positions. Cycle is controlled by limit switches of the automatic processing machinery, actuated by hydraulic cylinder, or an electric drive, to move in perfectly timed unison with transfer cycle of the automatic. Processed parts are loaded from the monorail onto the automatic.

*Wagner Brothers, Inc, 402 Midland Ave, Detroit 3, Mich*



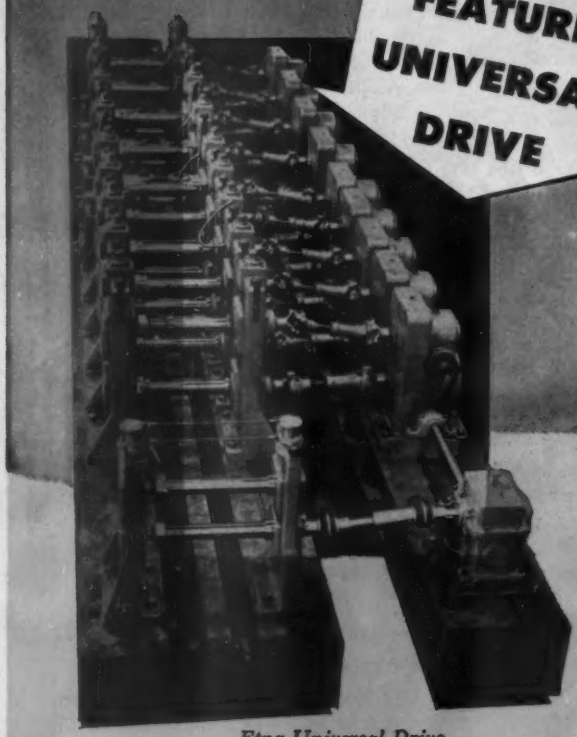
TWO STANDARD FERGUSON TRANS-O-MATOR MACHINES have been combined to meet requirements of an automotive manufacturer. End sections were added for width and extension pieces for length, so that transfer machine is 64 in. wide and 30 ft long. Using but one power assembly, unit has a 9-in. stroke and 88 usable stations—*Ferguson Machine & Tool Co, St Louis 21, Mo*



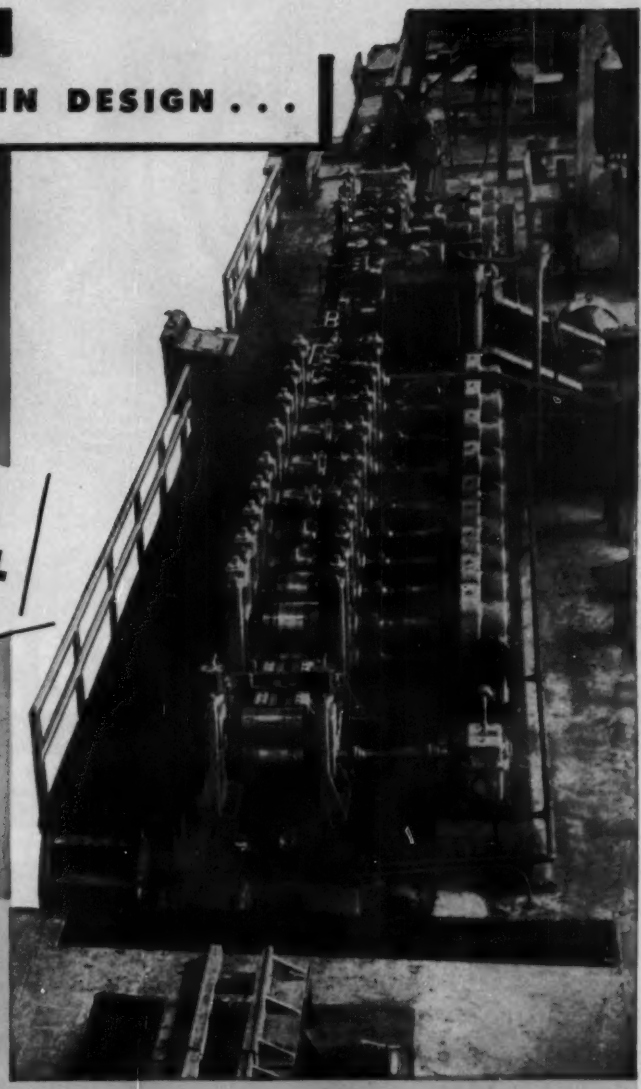
ARMATURE CORES in this automation system enter from stacking machine to first stage where insulating paper is formed and inserted into slots; insulated core progresses to one or the other of the two armature winding machines. Hesitation trap permits cores to roll down a steep track under control. At each winder, core is automatically chucked, wound, withdrawn, cut free, and deposited by short extension conveyor to plant conveyor system. Output in this installation is one armature every 8 seconds—*Globe Tool & Engineering Co, 436 Davis Ave, Dayton 3, Ohio*

**LEADING THE INDUSTRY IN DESIGN . . .**

# Etna TUBE MILLS FEATURE UNIVERSAL DRIVE



*Etna Universal Drive*



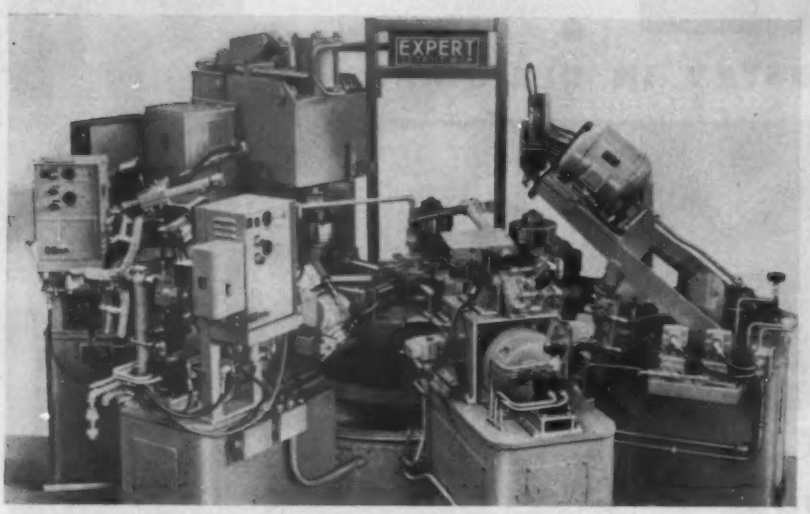
You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

**PERMANENT OIL COOLED TRANSFORMER**

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced.* Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

Abbey ETNA Company

**3404 MAPLEWOOD AVE., TOLEDO 10, OHIO**

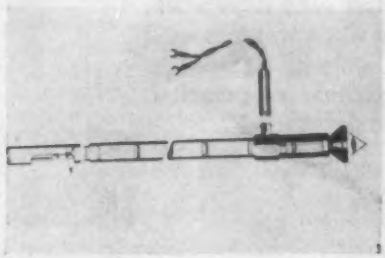



SIX-STATION ROTARY INDEX MACHINE presses, induction-preheats, welds, wire brushes, and unloads internal gear and stamped hub assembly at rate of 260 per hr. Two workpieces are air-clamped to rotary table which indexes work from station to station in automated setup. Clamps and gear drives tilt or rotate parts at stations for machine or finishing operations. Unit is about 11 ft in dia and 8 ft high—*Expert Welding Machine Co, 17144 Mt Elliott Ave, Detroit 12, Mich*

## Lufkin Micrometer Has Cam Lock

Lufkin micrometer calipers have cam lock which is designed to replace knurled lock nut. Turning lever ⅛ turn locks or unlocks the spindle. Replaces locknut on current production of 1600 and 1900 series at no additional cost.

*The Lufkin Rule Co, Saginaw, Mich*

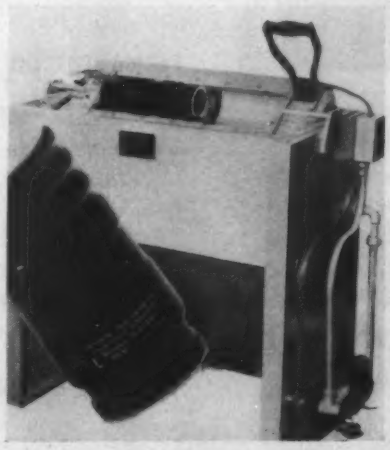


## Endoscope Permits Inspection Of Hard-to-Reach Objects

Designed to eliminate costly dismantling and save time in "blind" inspection, Endoscope is precision-built slender tube equipped with lighting and lenses that transmit image from point of examination to eyepiece for direct examination or camera recording.

Unit is available with diameters as small as 3/16 in. and lengths up to 23 ft. A variety of hinged and fixed devices for bottom, rearward, forward, and angular viewing is obtainable.

*Homestrand, Ind, 9 Addison St, Larchmont, NY*



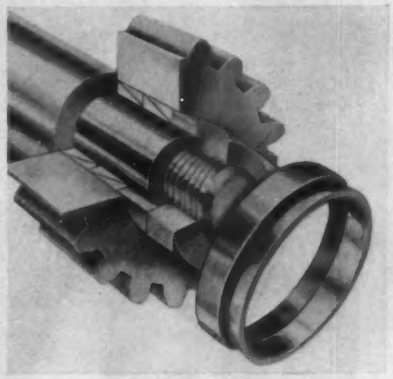
## Airgrit Marking Machines In Two New Models

Airgrit machines for reproducing permanent markings on glazed or polished metal, glass, plastic, fiber, and ceramic surfaces, are designed to mark delicate, precision, or thin-walled parts without danger of fracture or distortion. Operating on a forced blast principle, unit leaves an etched or frosted impression on the surface by blowing fine abrasive grit through relieved portions of a rubber mask.

Model 260 has a single jet blasting nozzle and a stationary top; it is recommended for marking small parts at rate of 500 or more an hour. Controlled blast is actuated by a foot switch; it can be adapted to automatic microswitch operation. Max marking is ¾-in. dia. Rollagrit Model is designed for marking cylindrical parts; production rate depends on size of parts. MicroSwitch in handle controls blast; part is rolled around the fixed nozzle by pulling the handle. Max marking area is 3 in. long.

Airline requirements for both models is 80 psi; electrical current, 110v, 60c, single phase.

*Jas H Matthews & Co, 3982 Forbes St, Pittsburgh 13, Pa*



## Gripspring Mounts Hub on Shaft Without Spline or Keyway

Gripspring, developed in Germany and now made and marketed in US, is device for mounting hubs on shafts without splines or keyways. Device, consisting of inner and outer wedge-rings, is wedged between hub and shaft under pressure from hand tools. Outer ring expands and inner ring contracts, forming no-clearance seal and eliminating danger from vibration. Grippings are said to transmit maximum torque for a given shaft diameter because full strength of both hub and shaft is utilized.

*U S Automatic Corp, Amherst, Ohio*

**Molded rubber parts,** custom produced to specifications, are available in a wide range of rubber compounds, either natural or synthetic. Parts of all types can be supplied for any standard or special requirement.

*Quality Rubber & Transmission Co, Dept AMN, 2203 W Chicago Ave, Chicago 22, Ill*

# GREENLEE

## *special-purpose machines for profitable mass production*

Master brake cylinder machined on above Greenlee Special Machine.

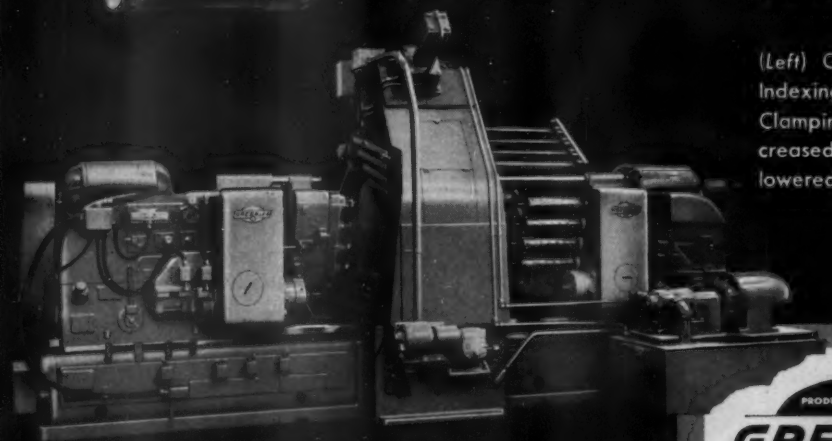
### THEY SAVE WORK...THEY SAVE MONEY

If you are being outdistanced in today's swift race for production...faced with narrowing profit margins...it will pay to investigate Greenlee Special Machines. Savings effected on drilling, reaming, boring, counterboring and tapping operations will quickly amortize your invested dollars.

Wheel cylinder machined on Greenlee Special Machine shown below.

(*Above*) Greenlee Horizontal Indexing Machine designed for processing master brake cylinders has proved itself with raised quality and lowered costs.

(*Left*) Greenlee Two-Way Horizontal Indexing Machine equipped with Power Clamping and Automatic Unloading increased previous production rates and lowered costs.



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PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1733 MASON AVENUE
ROCKFORD, ILLINOIS

# FASTER, EASIER SCHEDULING!

**Free literature shows how McCaskey Machine Control Board simplifies machine loading, scheduling, dispatching, job assignments**

The compact, adaptable unit shows work ahead for each machine or man, keeps work orders in sequence. Adjusts for schedule changes eliminating revision of lists, records and delays between planning and dispatching. Assures operation on schedule. Effective in production, assembly, maintenance or engineering.

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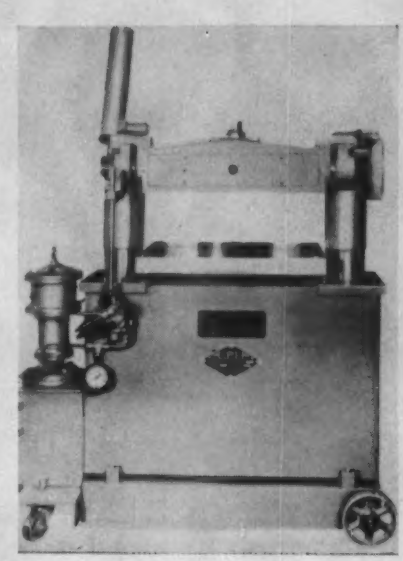
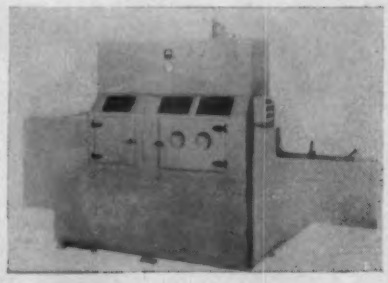


## Die Tryout Press Operates Airdraulically or Hydraulically

Mobile model is available in 50 or 75-ton capacities. Head can be released and rotated to any point up to 240°. Base houses two hydraulic cylinders.

The 50-ton unit occupies 28 x 56-in. floor space; over-all height with stroke down, 64 in. The 75-ton, 30 x 60-in. space has over-all height of 66 in. with stroke down. Tonnage of airdraulically operated press is based on 80 lb air pressure.

*Alpha Press & Machine, Inc, 9281 Freeland Ave, Detroit 28, Mich*



## Automatic Pressure Blast Unit

Wet blast unit for finishing of jet engine compressor blades processes both sides of the airfoil section at rate of approximately 200 per hr, removing heat treat scale and discoloration without stock removal or distortion. Unit also incorporates a rinse facility for removal of abrasive compound after blasting.

Blades are manually loaded on simple workholding fixtures which grasp at the root. A conveyor indexes blades into blasting chamber where a series of moving guns actuated by an air hydraulic cylinder accomplish finishing operation. Blades are then automatically in-

# A new dimension in motors!

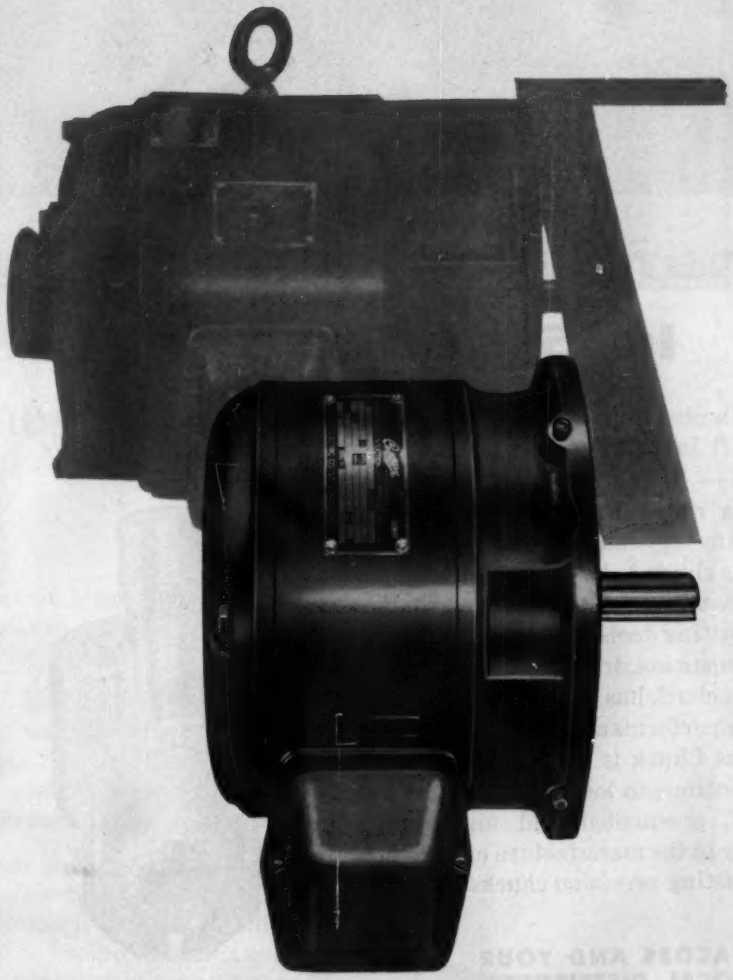
**SHORTER** Century **Performance Rated© MOTORS**

**SAVE SPACE...**
**SAVE WEIGHT**

This new line of shorter, round-frame, end-mounted motors by Century can give you greater freedom in design and engineering. They meet modern demands for compactness and weight-saving ... with even better performance.

**No special mountings are required!** These shorter Century motors have full-size NEMA "D" flanges. They are interchangeable with all other popular makes of standard end-mounted motors. The shorter motors are available in sizes from 1 to 15 H.P... in open or totally enclosed fan-cooled frames . . . for vertical or horizontal applications.

For full data, call your nearest Century Sales Office.



*Performance Rated©*
**MOTORS**
**⅛ to 400 H. P.**

**CENTURY ELECTRIC COMPANY**

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34

# Change cutting tools in 5 seconds!

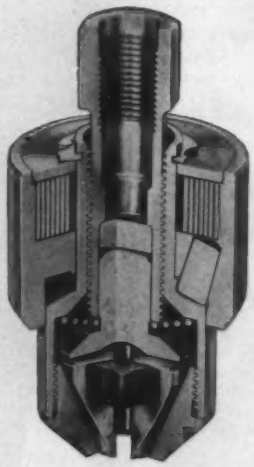
The Jacobs Impact Keyless Chuck designed especially for the aircraft industry makes fast tool changing possible, *and that's not all* —

This chuck has more gripping power than any ¼" chuck in the world.

This chuck *holds* tools in its tremendous grip — there's no slippage, no shank scoring, cutting tools last longer and replacement costs are drastically reduced.

This chuck has no key — to use or to lose.

The performance of the Jacobs Impact Keyless Chuck is another reason why you can continue to look to Jacobs for unquestioned, unequalled and uncompromising quality in the manufacture of hard holding, long lasting precision chucks.

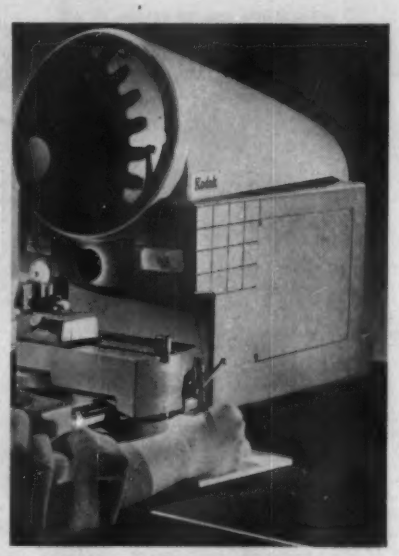


**JACOBS AND YOUR LOCAL DISTRIBUTOR**
are ready to deliver the chucks you need and the service you deserve.
***first in chucks . . . first in service***

**Jacobs**
**CHUCKS**
**If it's a Jacobs–it holds**


dexed into rinse cabinet and around to original load section, where they are manually unloaded.

*Cro-Plate Co, Inc, 747 Windsor St, Hartford 1, Conn*



## Kodak Model 8 Contour Projector For Portable Bench Inspection

Model 8 is said to be equally adaptable for either horizontal or vertical projection gaging. In addition to conventional methods, parts may be gaged by staging them in holding fixtures, and an angle measuring device, available at extra cost, adds to projector's versatility.

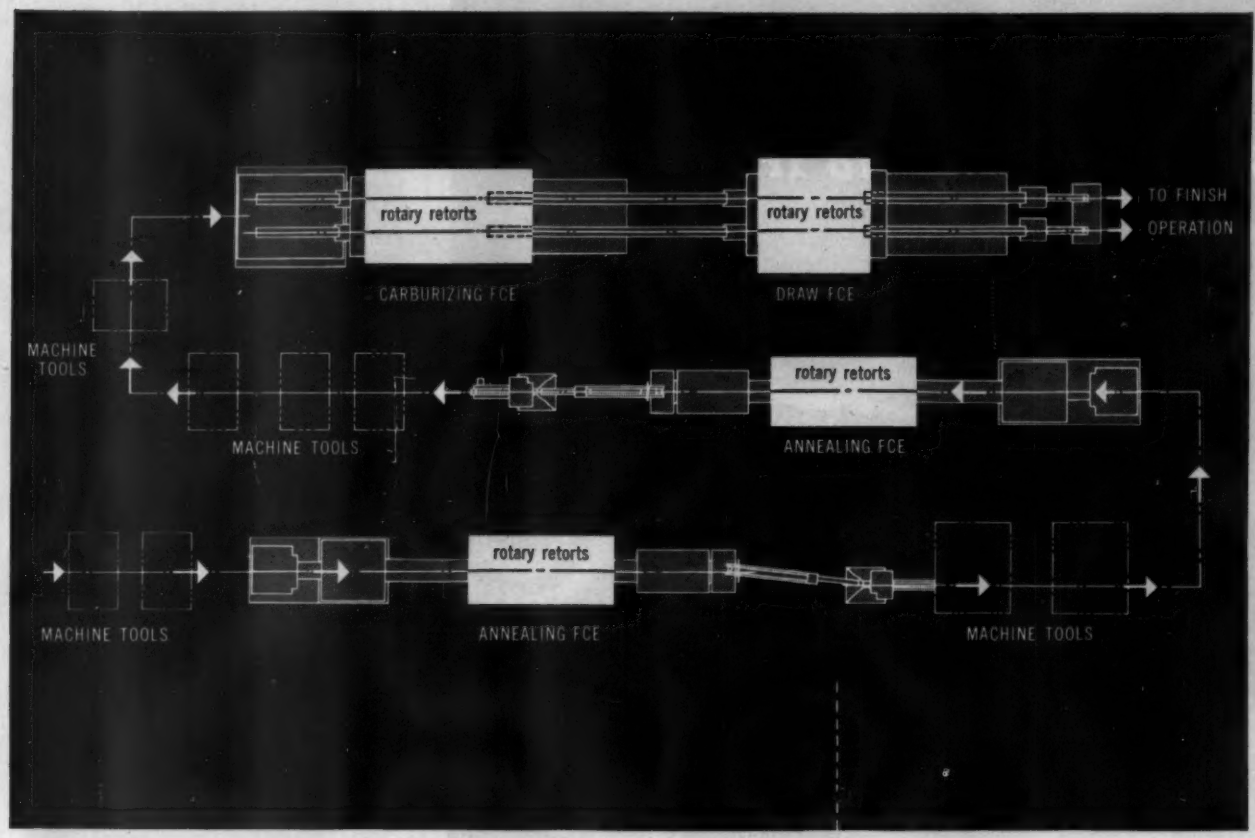
Coated Ektar lenses are used, and a special Kodak Ektalite field lens behind the screen is said to yield a bright image, permitting use of the projector anywhere in the plant.

Six magnifications are provided, from 10x to 100x, with interchangeable lenses. Erect image is produced. Lightweight wheeled stand permits use horizontally or vertically.

*Special Products Sales Div, Eastman Kodak Co, Rochester 4, NY*

## Greaves Plain and Universal Dividing Heads for Milling

10-in. dividing heads are designed for milling spline shafts, spur and helical gears, and multi-sided tools, such as tapered reamers. Both heads are equipped with No. 10 B&S taper, and have an index ratio of 40 to 1. Furnished complete with 3 index




# 'Surface' lines 'em up furnaces, machines, costs

There's more than one way to automate furnaces for high production, lower costs, and uniform quality—and 'Surface' engineers can show you a good many of them.

Dana Corporation, Marion Division, is a good illustration of the range of 'Surface' automation available. There you can see (1) different furnaces linked with machines at separate points on the line, (2) a self-contained automatic heat treat line within the production line, and (3) single furnace units with work handling completely automatic within each furnace.

Each of these types of automation results in higher production, more uniform quality, and lower handling costs than can be achieved in the conventional, isolated heat treat department. The point to remember is that these advantages aren't limited to high production plants; they can be applied to smaller operations as well. The sooner you apply them, the sooner they will pay off for you.

**Write for the Heat Treat automation story today, Bulletin H55-11**

Surface
HEAT TREATING EQUIPMENT

**SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO**
Also makers of Janitrol automatic space heating and Kathabar humidity conditioning units

# Spincraft did it for Gulf Oil...

## *Spincraft can do it for you!*

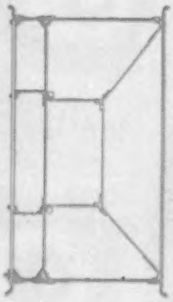
### "Marsh Buggy" travels over rugged terrain on spun aluminum wheels



**another example of spinning and fabrication by Spincraft**

**13 DIFFERENT OPERATIONS**

The "Marsh Buggy" rolls on sturdy, lightweight aluminum wheels — spun and fabricated by Spincraft. Even if all four balloon tires fail, the spun aluminum air-tight wheel drums will keep the vehicle afloat. Wheel flange segments, extensions, .118" thick 52SO aluminum stiffener ribs, No. 11 U. S. gauge (.125" thick) stainless steel front hub cones were machined and assembled to complete the wheels. In addition to spinning, Spincraft performed the following operations: welding, grinding, polishing, machining, punching, braking, drilling, tapping, sawing, riveting, assembly and testing.



Write for Spincraft data book. If you have a specific problem, tell us about it — no obligation.

WHEN Gulf Research & Development Co., a division of Gulf Oil Corp., contracted to build their world-famous "Marsh Buggy" for the U. S. Army, Gulf called on Spincraft to fabricate all four wheel assemblies.

These huge wheels are designed to bear loads of 1,500 to 4,000 lbs. Combining strength with lightweight, these tough aluminum alloy wheels can take grueling cross-country punishment. The 10-ft. dia. tires easily negotiate swamp, water, sand, deep mire and other difficult terrain, at speeds from ¼ to 40 miles per hour.

This is another example of Spincraft's versatility and manufacturing skill. Complete facilities are available for all types of contract manufacture — finished parts, assemblies and complete products. Take advantage of our modern tools for spinning and fabricating. They can pay off in savings for you, too.

**WORKSHOP OF AMERICAN INDUSTRY SINCE 1919**

**World's largest plant fully equipped for all types of metal spinning • deep drawing • stamping • fabricating**

Spincraft
SKILL WILL DO IT
INCORPORATED

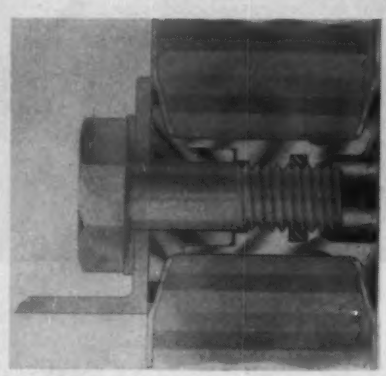
4136 WEST STATE STREET • MILWAUKEE 8, WISCONSIN


plates, adjustable tailstock, and center drive dog.

The universal head is also equipped with spiral driving mechanism, providing leads from 0.670 to 80.625 in., all divisions to 50, and all even divisions to 94, plus others. Included with the universal head is a complete set of change gears and guard to cover spiral driving mechanism.

Both units provide 10¾-in. swing, with 1 3/32-in. hole through spindle. Optional attachments include 6-in., 3-jaw universal, or 6-in., 4-jaw independent chuck; direct indexing attachment; 360° graduated swivel base; and high-division index plates.

*The Greaves Machine Tool Div, J A Fay & Egan Co, 2011 Eastern Ave, Cincinnati 2, Ohio*



## Self-Locking Insert For Threaded Bolt Spacer

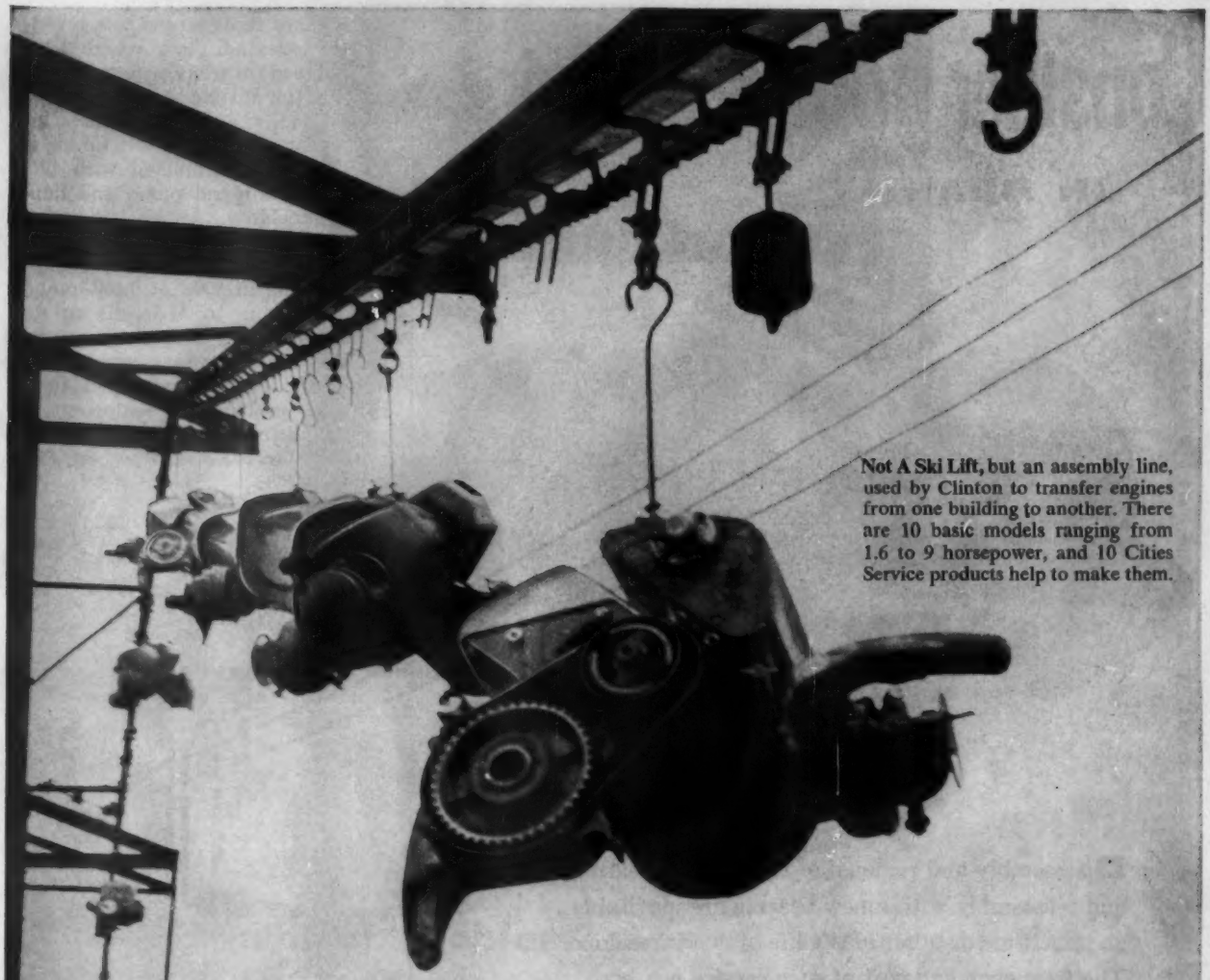
Fasco spacer is a 2-piece unit consisting of a plug and tapped sleeve containing a self locking nylon insert. The sleeve receives the attaching bolt, and is said to eliminate the need for a nut. Spacer lock is result of the nylon insert in the tapped sleeve section of the spacer.

Available in No. 10 screw size, for panel thicknesses of ½ to 1¼ in. Material is 24ST-4 aluminum anodized.

*The Delron Co, Inc, Fasco Div, 5224 Southern Ave, South Gate, Calif*

## Automatic Screw Slitter For Production Work

Automatic unit is equipped with a



**Not A Ski Lift,** but an assembly line, used by Clinton to transfer engines from one building to another. There are 10 basic models ranging from 1.6 to 9 horsepower, and 10 Cities Service products help to make them.

# "3,000,000 ENGINES IN EIGHT YEARS... CITIES SERVICE PLAYED MAJOR ROLE."

**Outboard Motors** are one of the chief products of Clinton Machine Company. Others include chainsaws and many types of gasolene engines for small power requirements.

Phenomenal is the word for Clinton Machine Company, Clinton, Michigan. Formed in 1946, it has expanded so rapidly that today it claims second place among U. S. producers of air-cooled gasolene engines and has already marketed 3,000,000 of these and other engines.

Were there lubrication problems? Of course. "But," says President Don Thomas, "I am happy to say they have continually been taken care of by Cities Service from the very beginning. In these formative years, Cities Service engineers came to our plants and recommended the proper lubricants for both our production machinery and the products we make. Thus, for the past eight years, we've used Cities Service Chillo Cutting Oils, Trojan Greases and Pacemaker Oils with complete satisfaction. We don't hesitate to say that the cooperation and outstanding service offered by Cities Service plus the quality of its products has played a major role in helping us build the Clinton Machine Company."

Time and again manufacturers like Clinton report unusual results using Cities Service Lubricants. Find out why. *You* may profit, too. Talk with your local Cities Service Lubrication Engineer or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

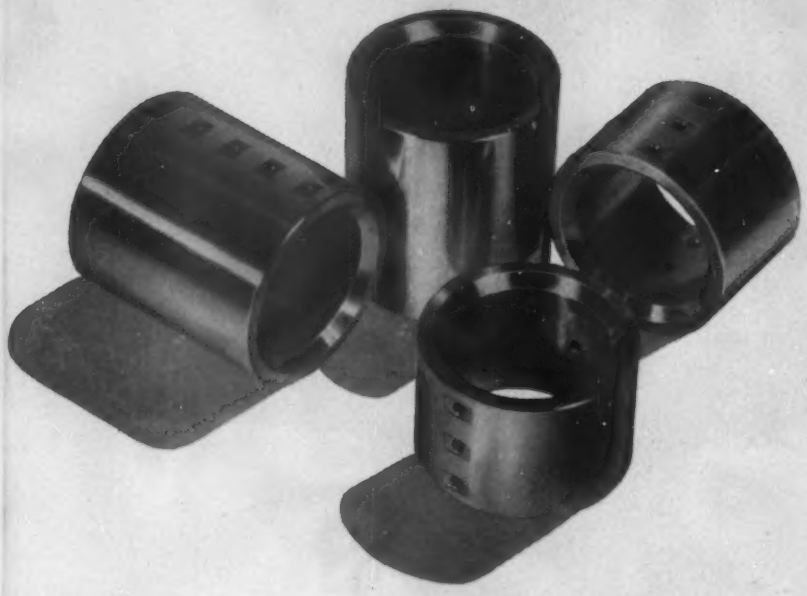
**CITIES SERVICE**

QUALITY PETROLEUM PRODUCTS

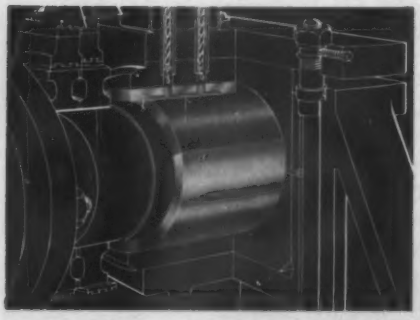
4136 WEST STATE STREET • MILWAUKEE 8, WISCONSIN

# Consider your customer...

## IN BEARING SPECIFICATIONS



Disassembly and removal of the original bearing and reassembly with a new bearing are inevitable at some time or other in the life of every machine. The frequency and cost of such service is a big consideration in the mind of your customer. The cast Bunting Bronze Bearing gives you maximum of bearing performance and life with far less costly and laborious replacement than any other type of bearing.



Designs like this present no production nor replacement complications. Bunting engineers will gladly collaborate with you in a study of your bearing requirements. There is a Bunting engineer near you, or write our Products Engineering Department at Toledo.

**Bunting®**

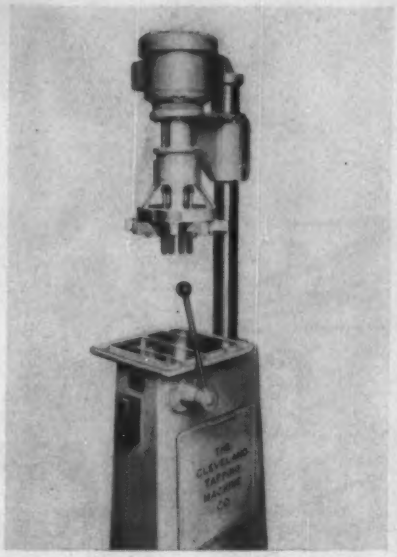
BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

THE BUNTING BRASS AND BRONZE COMPANY, TOLEDO 1, OHIO
BRANCHES IN PRINCIPAL CITIES • DISTRIBUTORS EVERYWHERE

hopper that feeds screws to a multi-station indexing plate where they are clamped for transfer to a circular cutter. After slitting at cutter, screws are ejected, and plate continues indexing for reloading. Plate timing is mechanically coordinated with slitting time. Integral pump and tank supply coolant.

Capacity, without special attachments, is up to 50 screws per minute, ranging in sizes of 0.100-in.-dia by ¼-in. long to ¼-in.-dia up to 2¾-in. long. Any head shape can be handled including set screws without heads. Four indexing plates are included as standard equipment to permit slitting various size screws.

*Haller, Inc, 684 Ann Arbor Rd, Plymouth, Mich*



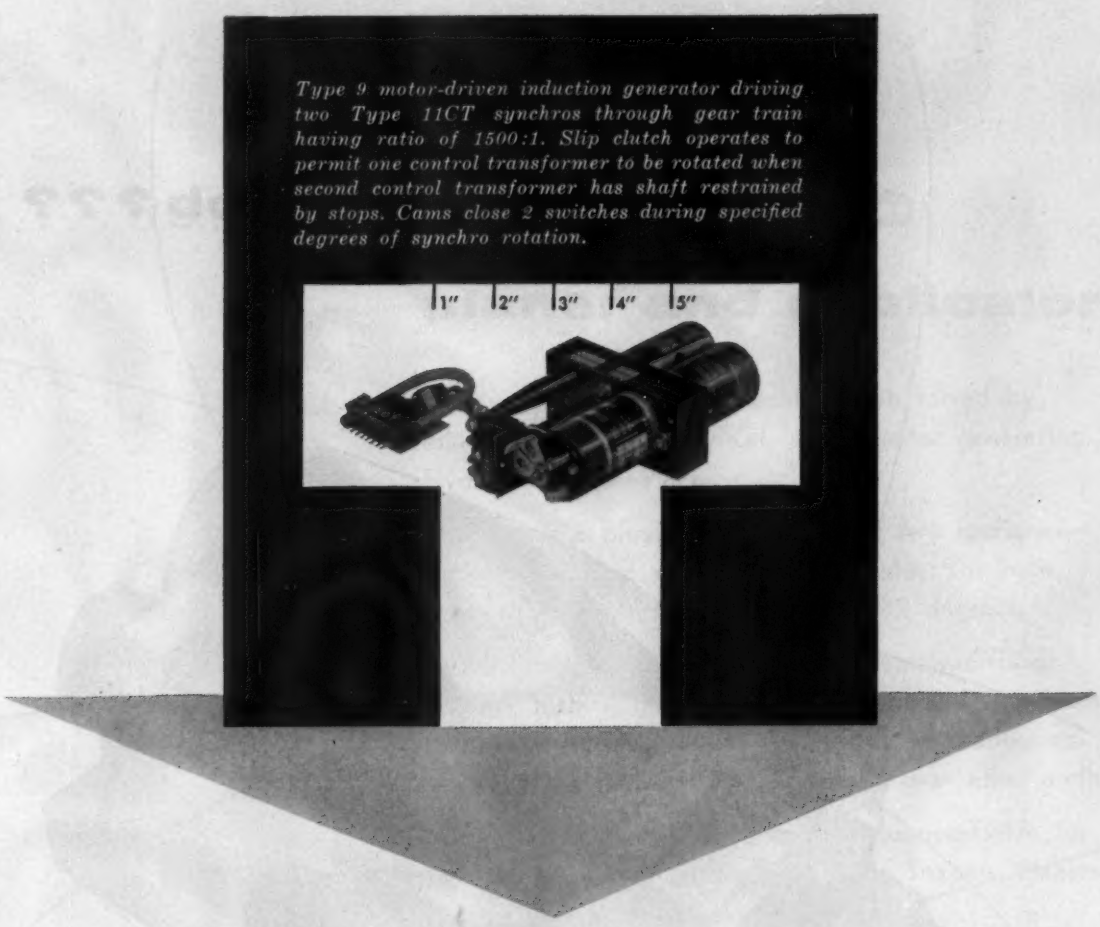
### Cleveland Drill-Tapper Head Is Stationary in Operation

Designed for multiple small-hole drilling and tapping, Cleveland Jr multi-spindle drill-tapper has universal-joint head which remains stationary in operation; table is raised to feed tools into work by downward pressure on lever. Machine drills eight holes up to No. 25 or taps eight holes up to No. 10-32 in mild steel at one operation.

Spindle speed is 2700 rpm and estimated operating speed 1200 strokes per hr. Spindles are adjustable to minimum spacing of ¾ in. within 8-in. bolt circle. Stroke is 4 in. and head is adjustable to provide clearance between spindle nose and table of 1 to 12 in.

1-hp, 220/440v vertical motor operates continuously in one direction in drilling. In tapping, reversing switch

*(Continued on page 218)*




*Type 9 motor-driven induction generator driving two Type 11CT synchros through gear train having ratio of 1500:1. Slip clutch operates to permit one control transformer to be rotated when second control transformer has shaft restrained by stops. Cams close 2 switches during specified degrees of synchro rotation.*

## big control problem . . . small servo solution

Despite its small size and extreme compactness, this Transicoil plug-in servo assembly always "does the job right". That's because it was especially designed for a single application . . . by a company whose major function is solving individual servo control problems with complete, precisely engineered and manufactured servo assemblies.

Of course, if you just want servo *components*, Transicoil can provide them to the highest order of precision and accuracy. But it is in the "package" engineering of unique assemblies that Transicoil's experience and creative imagination offer the greatest value. And in most cases, these assemblies cost no more than the individual components would purchased separately. Check your next servo problem with Transicoil first. You'll find it pays — in precision, in space, and in economy. Ask for the new availability guide for precision gear motors at the same time.

# Transicoil

**CORPORATION**

**Worcester • Montgomery County • Pennsylvania**

# extremely difficult job???

# . . . not for a **hydraulic**

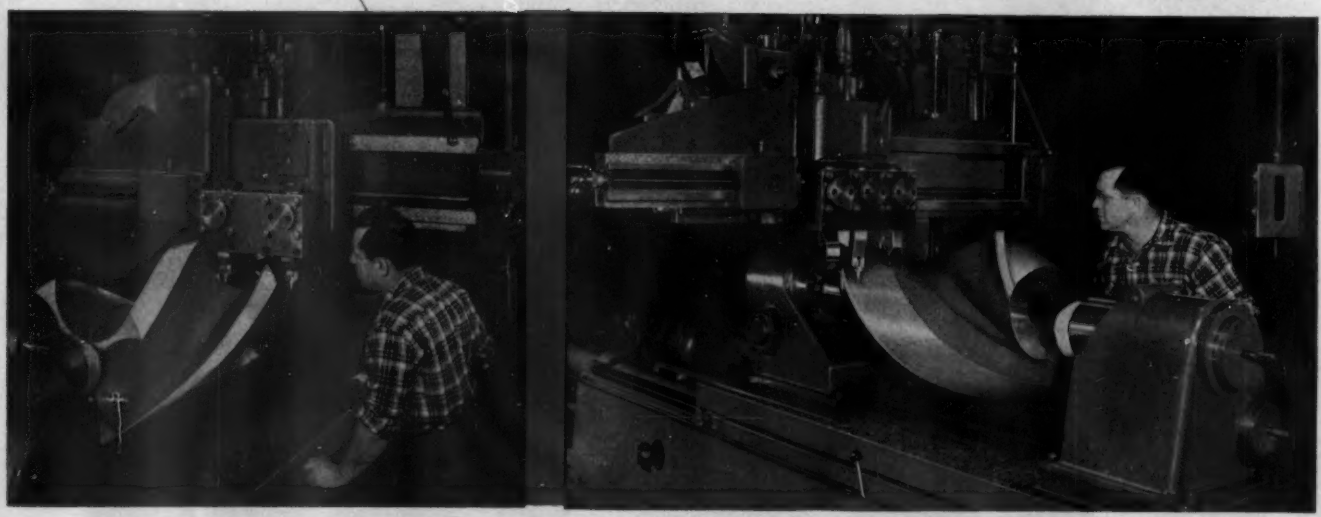
## planer and duplicator

Here's another complex machining job solved by using a Hydraulic Kopy-Kat, with a rotor generating Hydraulic Shaper-Planer.

The part is a blower and consists of two sections — a two lobe rotor and a four lobe gate. The helix angle of the rotor is approximately 32 degrees.

Hydraulic Drive is a natural for extremely difficult shaping, planing, slotting and duplicating. It produces accurate work with substantial savings in production time — often several hundred percent over other methods.

Ask a Rockford Machine Tool Co. representative for the latest facts on modern Hydraulic Shapers, Planers, Slotters, Shaper-Planers and Kopy-Kats.



**ROCKFORD MACHINE TOOL CO.**

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

# Notching Sheet Materials?

## Do It Quickly, Easily with a DI-ACRO* NOTCHER

Speed up notching operations, eliminate the need for heavy presses and dies with a Di-Acro Notcher. A 6"x6" notch can be made in 16 gauge material in one operation. Many straight shearing jobs also performed.

*pronounced DIE-ACK-RO

**BOTH HAND AND POWER OPERATED MODELS AVAILABLE**

Di-Acro Power Notcher is especially designed for operations where high rate of production must be maintained. Motor driven flywheel and all moving parts housed in welded, steel cabinet.

Hand operated Di-Acro Notcher is ideal for short run production or experimental use.

**WANT MORE INFORMATION?**

*Send for 32-Page Catalog*

Gives complete details on Di-Acro Notchers, Benders, Brakes, Punch Presses, Rod Parters, Rollers, Shears, Spring Winders and Press Brakes.

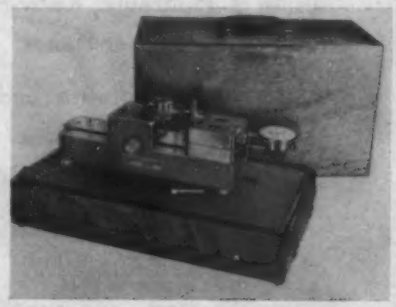
**O'NEIL-IRWIN MFG. CO.**
311 8th Ave.
Lake City, Minn.

di-acro PRECISION METALWORKING MACHINES


reverses motor to back out tap when desired thread depth is reached; when top of stroke is reached, motor is again reversed. Change from drilling to tapping is made by pressing proper control button.

For fully automatic production, machine can be furnished with air lift and hydraulic checking mechanism which travels table through any stroke up to 4 in. Unit is 82 in. high, has 14 x 22-in. cast base.

*Cleveland Tapping Machine Co, Canton 6, Ohio*



### Portable Gear Tester Provides Permanent Strip-Chart Record

Instrument is used for checking helical, spur, and worm gears. Two kinds of check are provided—either visual or a permanent strip-chart record. Said to provide runout and tooth-to-tooth inspection within 0.0001 in.

Three models are available. Model A is small, hand-operated unit. Model B is larger hand-operated device. Model C is similar to Model B, with addition of variable-speed motor drive and electrical pickoff for use with strip chart recorder.

All models have carrying case with removable cover, while Models B and C have drawer for holding arbors and master gears.

*Arch Instrument Co, Inc, 101 Holmes St, N Quincy, Mass*

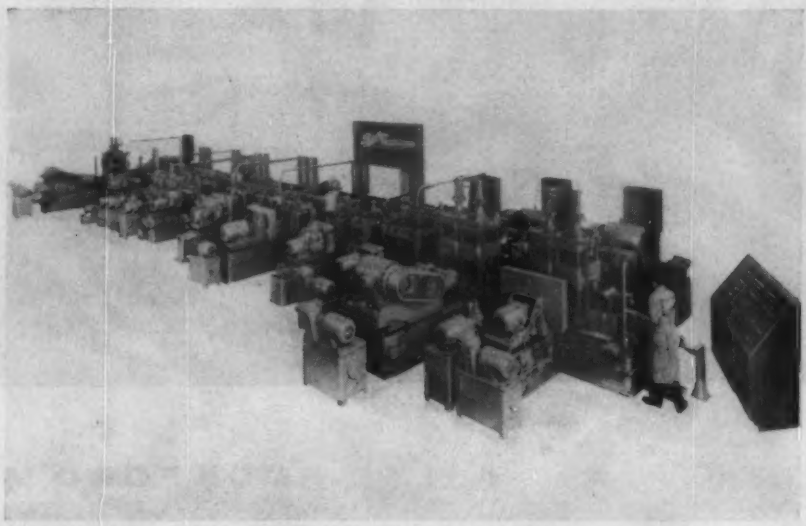
### Lundholm Coolant Refrigerators Designed for Multiple Stacking

Liquid Chiller line includes horizontal and vertical cabinet units in sizes ranging upward from 5 gpm. Model X horizontal unit is made in sizes from 2 hp through 7½ hp, measuring 46 x 26 x 30 in. Units are designed for stacking to save floor space and give continuous operation.

Model H-T vertical unit has 7½-hp semi-hermetic cooling system, is 26 x 50 x 26 in., and is designed for 30 gpm operation with 6° temperature difference.

Units are furnished with drier, ex-

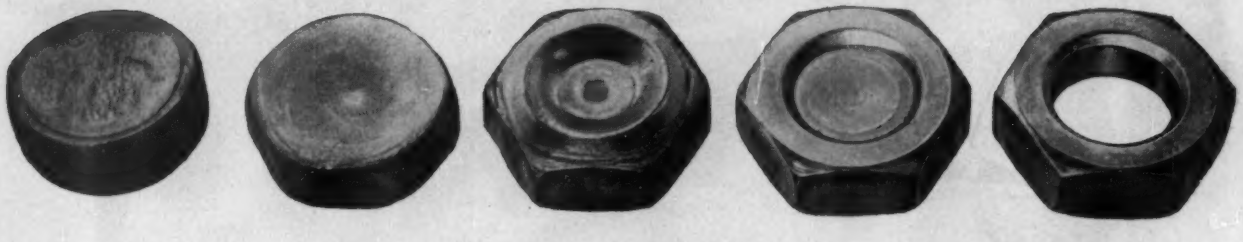
*(Continued on page 220)*



45-STATION BUHR ECONOMATIC TRANSFER MACHINE performs 249 drilling, boring, reaming, and tapping operations on 52 automatic transmission cases per hour. Parts are received with three surfaces milled, then machine automatically handles and repositions part to present proper surfaces for machining —*Buhr Machine Tool Co, Ann Arbor, Mich*

# YOUNGSTOWN
# STEEL ROUNDS

## *used in manufacture of quality RB&W nuts*

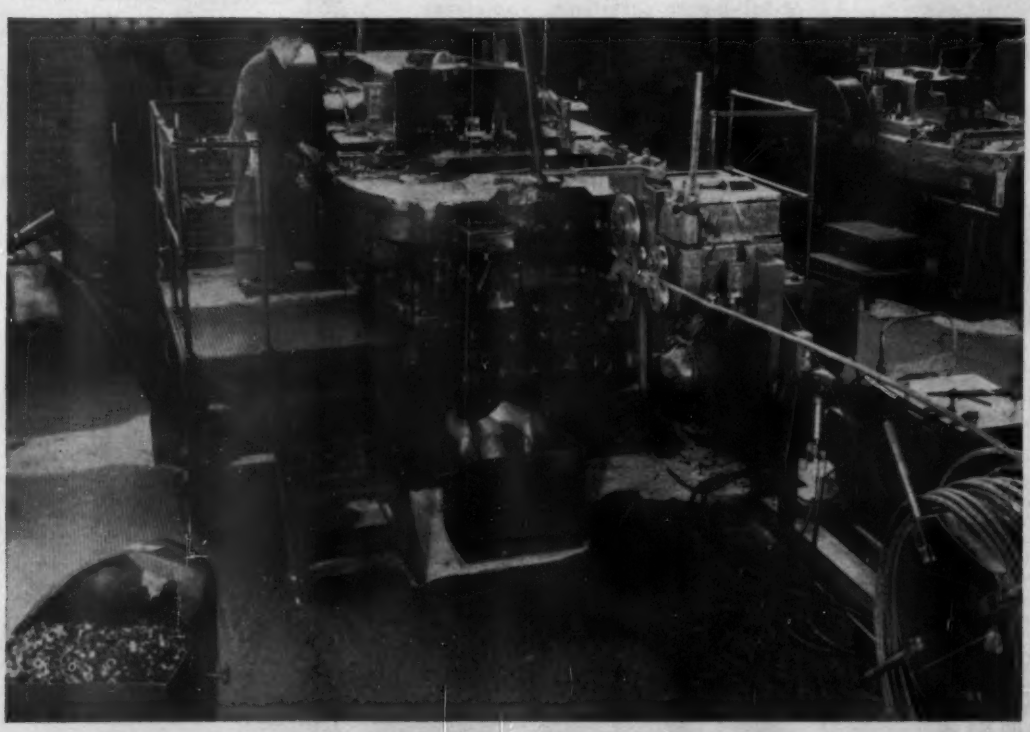


Russell, Burdsall & Ward Bolt and Nut Company pride themselves on the strength of their bolts and nuts. Justifiably, too, because they fabricate tremendous quantities of nuts from Youngstown Scrapless Nut Quality Steel. Not an ordinary steel, each step in making this Youngstown steel, from ore to the finished product, is closely controlled.

That's why, when nut formers punch and pound it, and when threading machines give it another going over, a nut made of Youngstown Steel comes through a winner. This material is free of injurious seams and also machines cleanly in the threading operation.

When you order Youngstown Scrapless Nut Quality Steel, either in Bar, Rod or Wire form, you can be sure it will be held to the right tolerances. Nothing less than perfection is the Youngstown policy.

The payoff for you will come in the form of your finished product.



**Five stages of nut making with Youngstown Scrapless Nut Quality Steel Rounds. Made by Russell, Burdsall & Ward, the end result shows what can be done with quality steel. The production machines are running smoothly at the Russell, Burdsall & Ward plants. Nuts by the millions are produced daily. Some are shown in the container in the foreground.**

QUALITY YOUNGSTOWN SERVICE

**THE YOUNGSTOWN SHEET AND TUBE COMPANY** *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE - TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

TORIT
DUST COLLECTORS

Really draw!

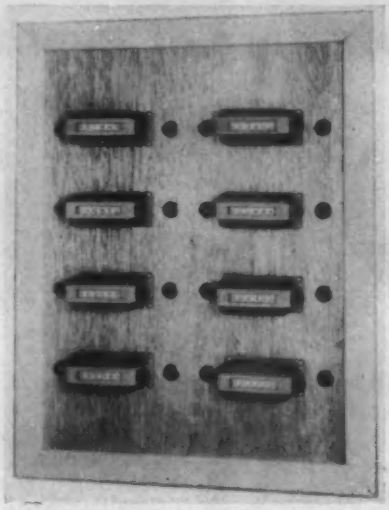
A size and model to solve any dust collecting problem, Torit collectors provide complete, all-around dust control. Torit collectors are unitized for custom installation on each machine, giving power and suction only when machine is operating. Keeps plant and machines free from clogging and unsightly dust. Furthermore, cleaned and filtered air is exhausted back *into* the room maintaining heat balance. Find out now how Torit unitized dust control is engineered to your problems.

*See our catalog in Sweet's Machine Tool File, or write:*

TORIT
MANUFACTURING CO.
280 Walnut Street • St. Paul 2, Minn.

pansion valve, combination pressure control, temperature control, and, on water-cooled models, a water valve.

*Distributed by Industrial Filtration Co, Dept LC 287, Lebanon, Ind*

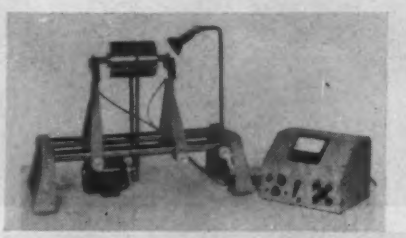


## Remote-Reading Control Panel Contains Counters, Lights

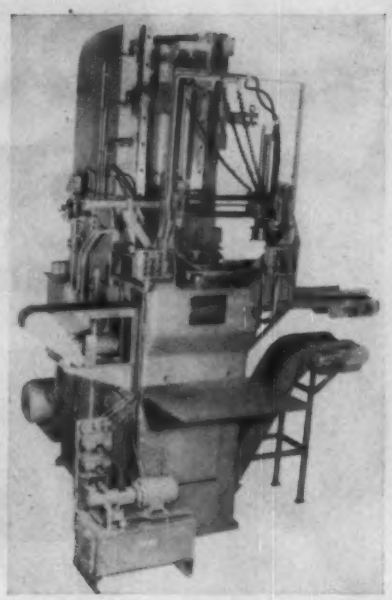
Designed for use with B & S automatic screw machines, remote-reading control panel records production of full-length parts only, also shows by means of signal lights whether machine is operating. Panel board can be supplied in sizes to accommodate any number of counters and signal light sets.

Each counter is directly connected to Count-O-Larm unit installed on B & S machine. Counters can be individually re-set by means of an external knob. Signal light is green when machine is operating properly, red when machine is out of stock. Control panel can be centrally located to provide check on any number of machines.

*Count-O-Larm Co, 1271 W North Ave, Chicago 22, Ill*



ELECTRONIC DYNAMIC BALANCER, bench Model SU-6, will handle any rotating body from 4 oz to 100 lb, up to 20-in. max dia — *Micro Balancing, Inc, Herricks Rd, Garden City Park, NY*

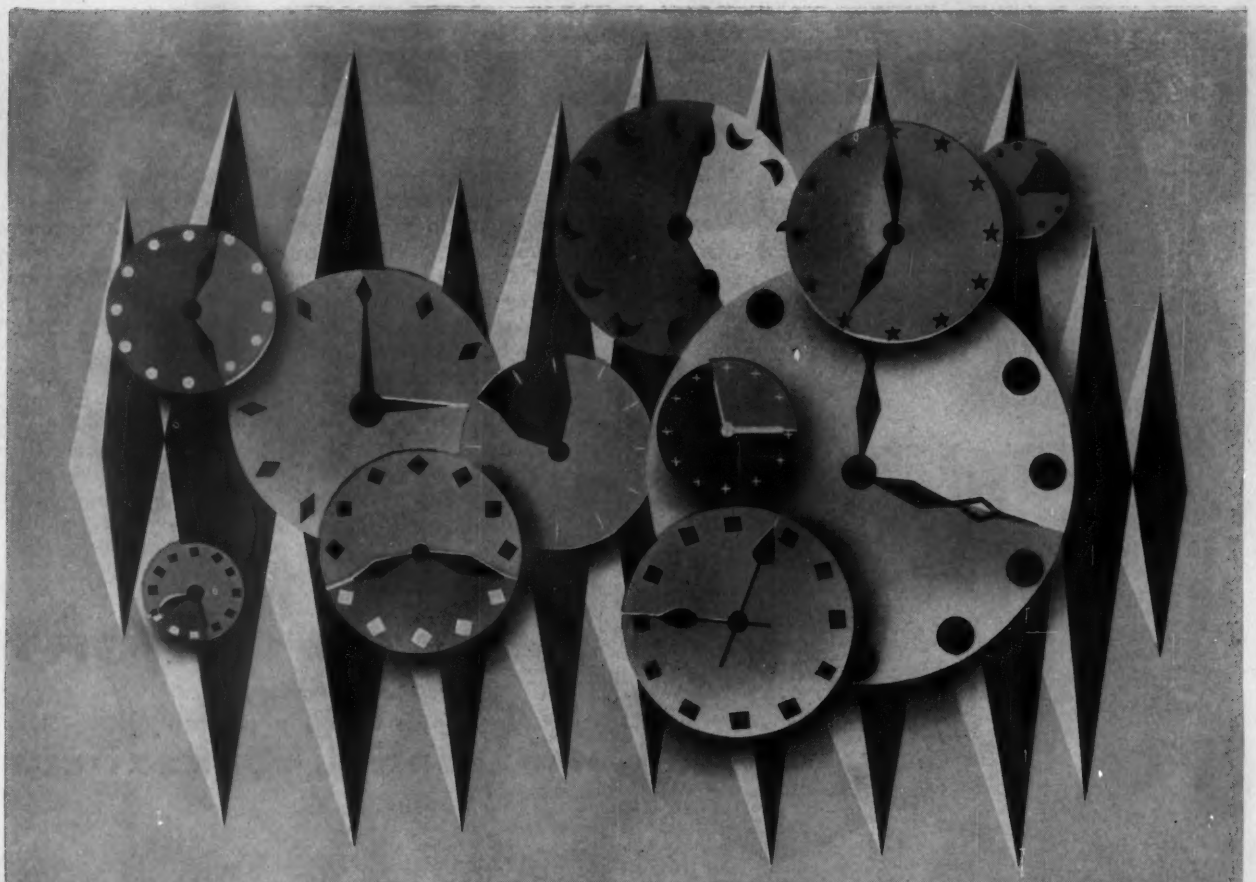


AMERICAN 30-TON PULL-DOWN BROACHING MACHINE has 60-in. stroke, broaches ten 1-in. internal splines in an automotive brake drum in one pass. Model PD-6-30-60 features a hydraulic loading mechanism with an internal chucking device which picks up the part off the conveyor line and transfers it to the work-holding slide fixture; after broaching, the slide moves out, ejecting the part back onto the belt conveyor — *American Broach and Machine Co, Ann Arbor, Mich*

## No-Dust Grinders In Three Sizes

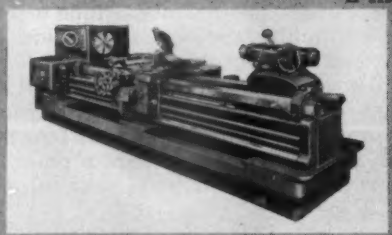
Hammond No-Dust grinders are available in three sizes of 1, 2, and 3-hp motors using 10, 12, and 14-in. dia wheels. The self-contained built-in dust-collector unit traps dust and

(Continued on page 224)



# "beat the clock"— is no game

"Beat the Clock," a famous television program, has become a popular home party game. But industrialists know that getting the most out of every hour on the time clock is no game, but a serious competition for business survival. The answer is not one of getting tough and bearing down harder. It's a problem, rather, of providing equipment that permits a man to work at a higher standard of productivity. When it comes to lathe work, that's an Axelson—a lathe with honesty in its design and integrity in its construction. Call or write us. We'd like to drop in and tell you about it.



AXELSON LATHES

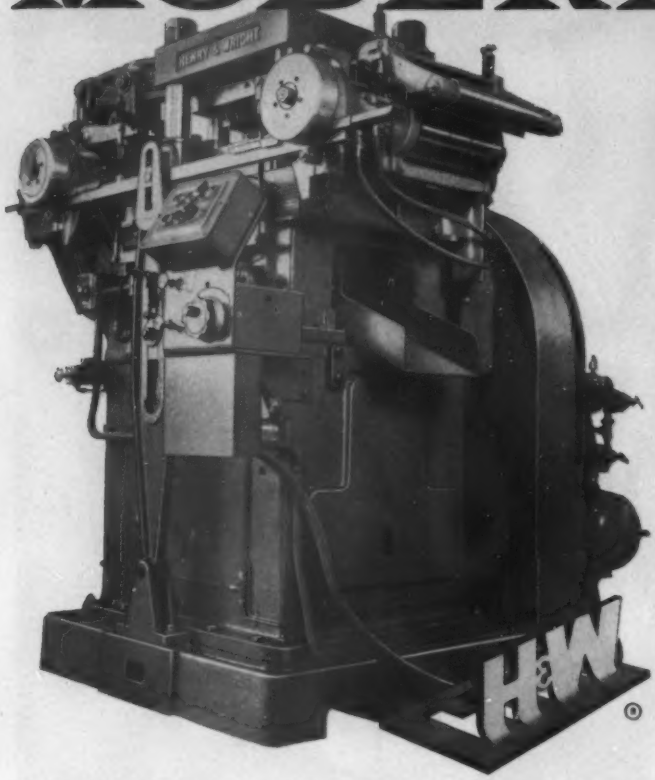
make man hours mean more

AXELSON MANUFACTURING COMPANY

DIVISION OF U. S. INDUSTRIES, INC.

6160 S. BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA • Dealers in Principal Tool Centers of the U. S.

# MODERNIZING?



With a Henry & Wright you can shift from a straight blanking job to a complex progressive die and know that you will get maximum efficiency on both. Versatility? Sure. But there's more. You can push those jobs through at speeds to meet the toughest production schedules. And you can effect die changes quickly enough to make even short runs less costly.

Precision punch and die alignment is assured by the Henry & Wright's exclusive design features — its long ways, the fact that it uses a pulling instead of pushing stroke, the solid rigidity of its frame and four post guidance. For versatility . . . for work quality that goes up and stays up . . . for costs that keep going down . . . modernize with Henry & Wrights.

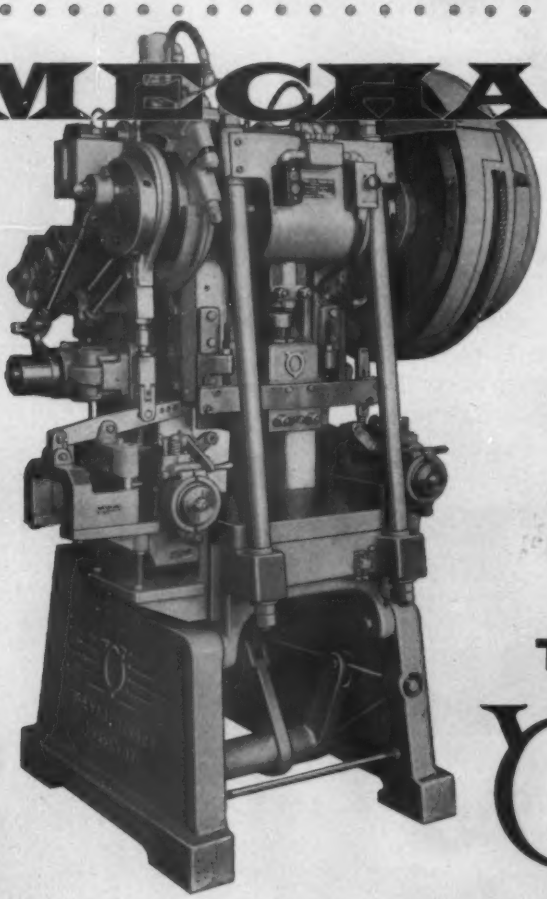
**HENRY & WRIGHT**

Division of Emhart Mfg. Co.

461 WINDSOR STREET

**HARTFORD 1, CONNECTICUT**

# MECHANIZING?



You can't get the complete story on what equipped presses can do to effect new economies until you've discussed it with V & O. We've specialized in "packaged" production units for over 60 years.

On top of that, V & O presses are engineered for mechanization. Built to the highest machine tool standards, V & O's feature the precision of long slides, hand-scraped ways and bearings — refinements pioneered by V & O to provide the accuracies essential to efficient operation of tools and attachments. If you want an equipped press, engineered and tooled by acknowledged experts, see V & O. If you want a press that is easiest for your own tool engineers to mechanize, make sure it's a V & O.

**THE V & O PRESS CO.**

Division of Emhart Mfg. Co.

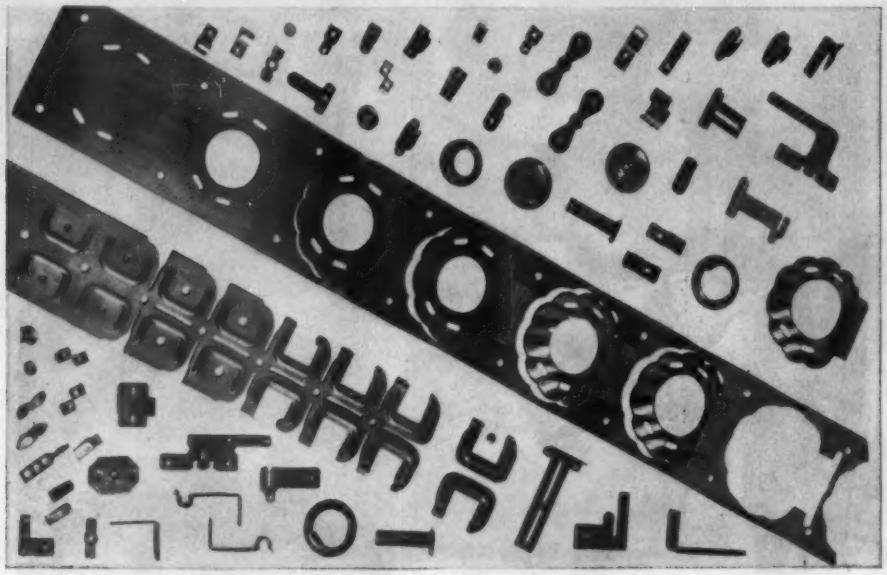
301 UNION TURNPIKE

**HUDSON, NEW YORK**

## LOOK WHAT YOU CAN DO WITH A

# HENRY & WRIGHT

Each of the parts shown below was produced complete-per-stroke from coil stock. Work quality through the steps in the progressive die is thus subject to only two variables—the precision of the die and the care with which it is set. You can control these. The precision of a Henry & Wright does the rest.

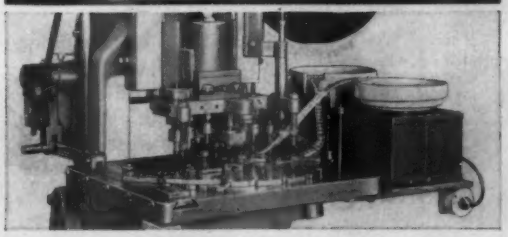


## LOOK WHAT YOU CAN DO WITH A

# V & O PRESS

Model 50S V & O, using an 18 station dial feed and a five station progressive die, makes outer housings for ball bearings.

Set up here produces finished piece, using slide and dial feeds with blanking, forming and piercing dies.



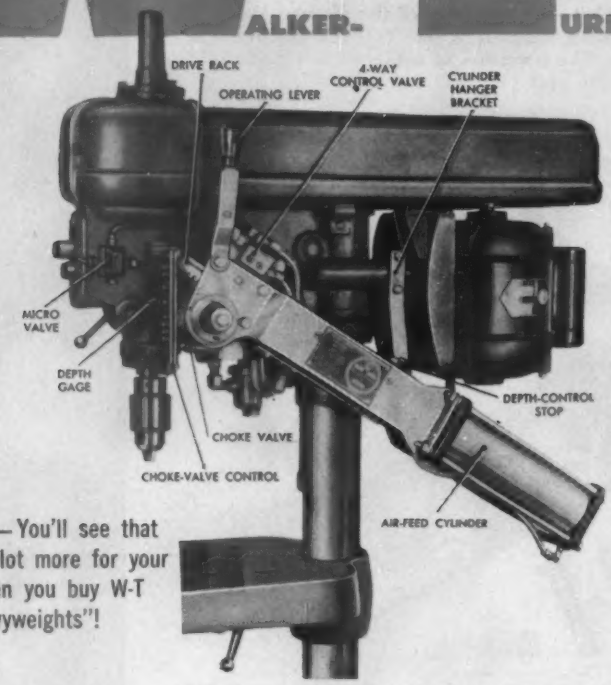
This equipped V & O press has two hopper feeds synchronized with a dial feed and multi-station progressive die.

EMHART MFG. CO.

*Only the best is good enough*

# W-T

ALKER-TURNER




COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

**You can install this new time-saving, money-saving Air Feed in 10 minutes!**

100% PNEUMATIC! NO ELECTRICAL CONNECTIONS! NO MACHINING! Wherever you have repeated drilling and related operations, this new Walker-Turner Air Feed will whittle down your costs and put you in a much better competitive position. It converts any Walker-Turner, or W-T type, Drill Press up to 1" capacity to a high production power-fed drilling machine. Gives sensitive, automatic feed control for a wide variety of production operations in metal or wood. Even short-run jobs are more profitable when you install Air Feed! . . . Air Feed Attachment for 15" and 20" Drill Presses, 4" and 6" spindle travel; prices start at $185. Air Feed-equipped Walker-Turner 15" and 20" Drill Presses, 4" and 6" spindle travel; prices start at $353. . . . Ask your Walker-Turner Distributor to *demonstrate*. He's listed under "Tools" in your phone book's Yellow Pages. Or write today for his name and your new, *free* Manual.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT — RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS — RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS — JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

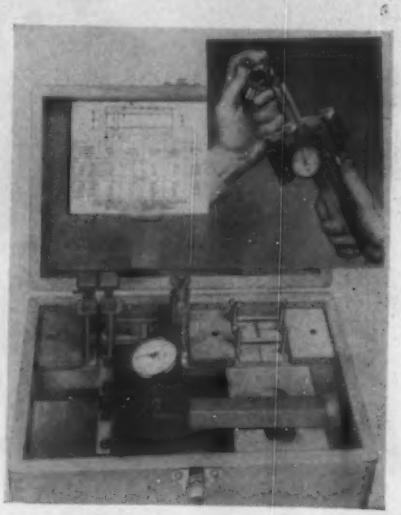
walker-Turner

**WALKER-TURNER**
Division
Kearney And Trecker Corporation • Plainfield, N. J.


dirt at its source from light tool or snagging operations or from intermittent grinding on heavier operations.

Dust-collector unit is serviced from front of machine, requires only few minutes for installation. Because unit is built in, floor space is practically the same as for grinder without dust collector.

*Hammond Machinery Builders, 1600 Douglas Ave, Kalamazoo, Mich*



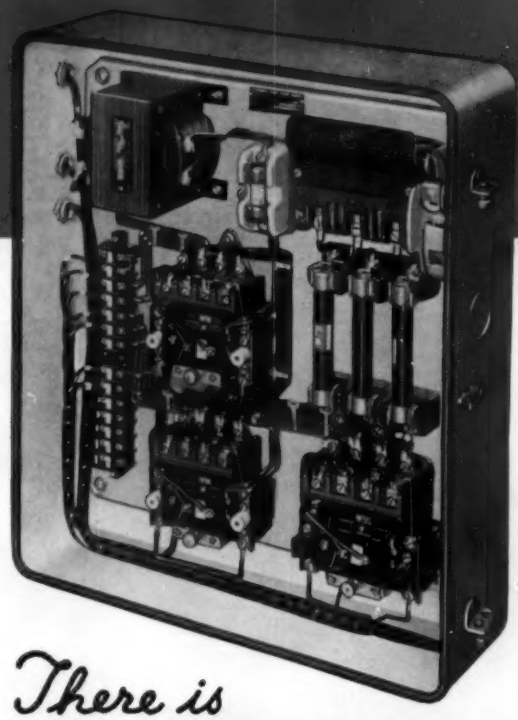
BRYANT PORTABLE GROOVE GAGE is available in package unit which contains 8 pairs of segments. Four basic pairs serve O-ring grooves through 5 in. in diameter, while the other four pairs check snap ring grooves to 5 in. in diameter. Dovetail clamps give each pair of segments a 2-in. adjustable range. Special groove segments are also available— *Bryant Gage & Spindle Div, Bryant Chucking Grinder Co, P O Box 620, Springfield, Vt*

## Heavy Duty Tapholders For Wide Range of Taps

Vilter Model 120 Tru-Hole tapholder is designed to be used in combination with company's Tru-Hole sensitive turret attachment. Holder is mounted on 2-in. round nose and held by means of a 2-in. square socket on 2-in. ram of the sensitive attachment. Product will fit all sen-

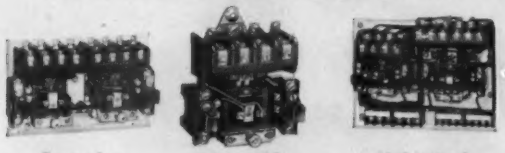
Oakes mixing machine for continuous mixing of raw materials in the rubber and chemical industries.

The Sign of QUALITY MOTOR CONTROL

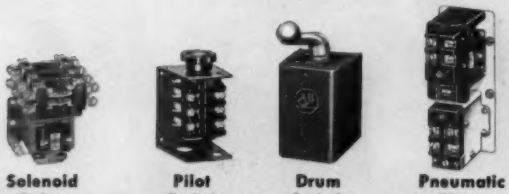


Close-up of Allen-Bradley automatic motor control panel.

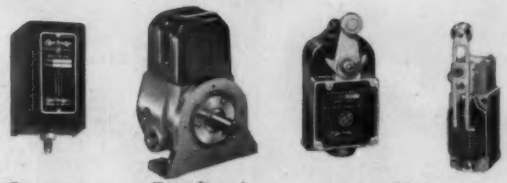
## Service-tested Components for Automation Control Panels



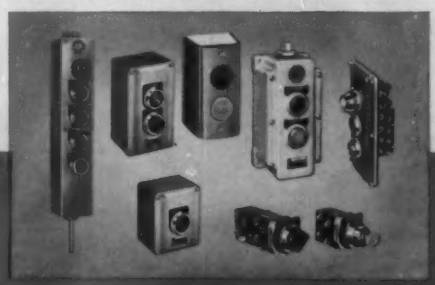
Reversing Switch — Solenoid Starter — Multispeed Starter



Solenoid Relay — Pilot Switch — Drum Switch — Pneumatic Timer



Pressure Switch — Zero Speed Switch — Limit Switches



Push Buttons

# *There is* SALES VALUE for YOU in the A-B TRADEMARK

Time has established the A-B trademark as the sign of Quality in motor controls. It is so recognized by the buyers of your motorized machines. So, why not standardize on Allen-Bradley controls.

Years and years of trouble free service in every conceivable industry has proved conclusively that A-B controls are a real sales asset to any machine. You just cannot beat Allen-Bradley controls for simplicity in design . . . your guarantee for reliable and consistent performance.

Whether you need a single starter or an all-inclusive special control panel, call in your nearest Allen-Bradley sales engineer. Let him recommend the components that will assure the most continuous output from your machines.

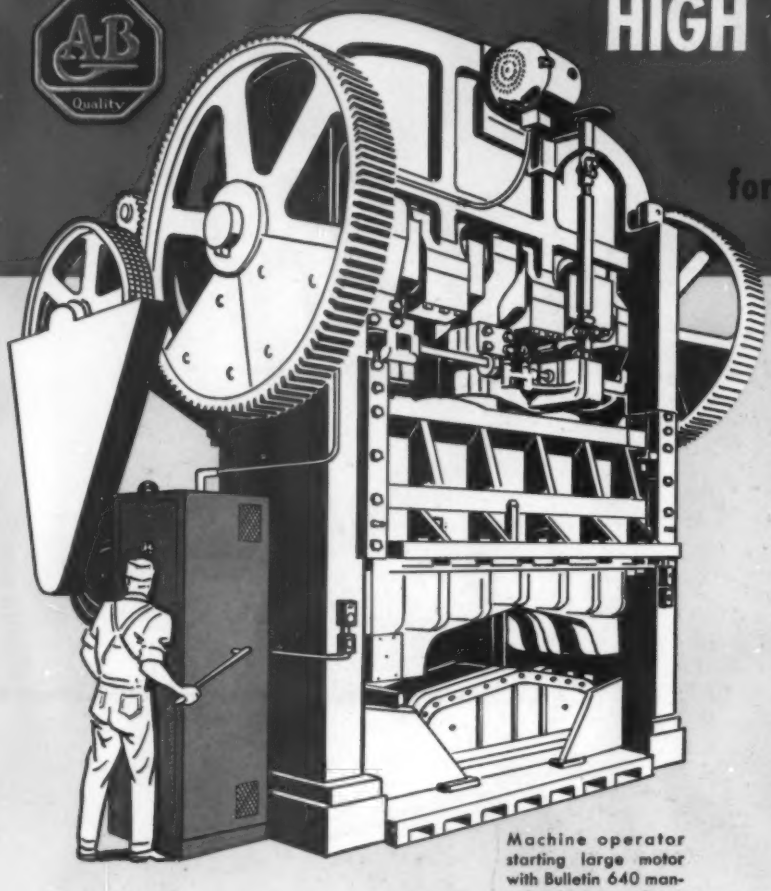
Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

In Canada—Allen-Bradley Canada Ltd.
Galt, Ont.

**ALLEN-BRADLEY**
SOLENOID MOTOR CONTROL
QUALITY

9-55-MR

# HIGH & LOW VOLTAGE STARTERS for BIG MOTORS



Machine operator starting large motor with Bulletin 640 manual velvet smooth resistance starter. Starting jolts are eliminated.

**BIG STARTERS** for big motors . . . for 220-440-550 volts . . . for 2000 to 2500 volts . . . and for 2501 to 4600 volts . . . are catalog listed units in the Allen-Bradley line. Illustrated below is a limited variety of starters for squirrel cage, wound-rotor, and synchronous motors. Starters for manual or automatic operation are available. Starters for 600 volts or less are available in ratings up to 600 hp. High voltage starters are rated up to 1500 hp.

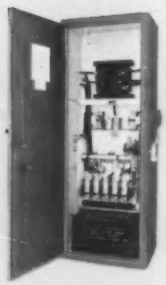
Write for a copy of the Allen-Bradley Handy Catalog in which all varieties of "big starters" are listed. It is also a handy buyer's guide on the latest developments in controls and accessories.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

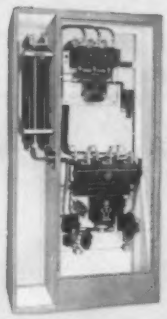
In Canada
Allen-Bradley Canada Ltd., Galt, Ont.

**ALLEN-BRADLEY**
SOLENOID MOTOR CONTROL
QUALITY

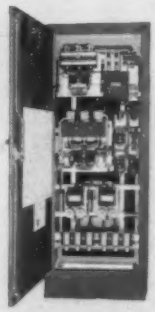
## A FEW OF THE BIG STARTERS IN THE ALLEN-BRADLEY LINE



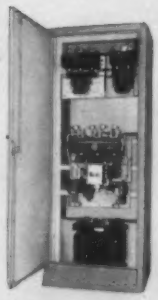
Bulletin 646 manual autotransformer type starter



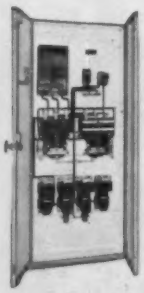
Bulletin 740 automatic reduced voltage motor starter



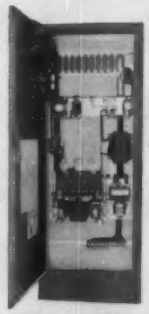
Bulletin 742 automatic starter—velvet smooth acceleration



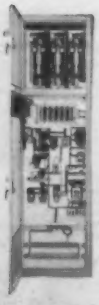
Bulletin 746 automatic autotransformer type starter



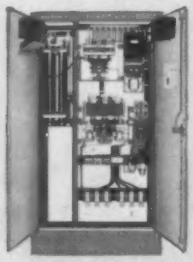
Bulletin 761 automatic wound-rotor motor starter



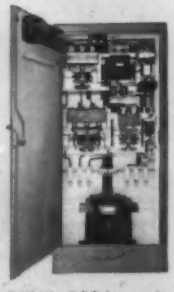
Bulletin 906 across-the-line synchronous motor starter



Bulletin 906 high voltage synchronous motor starter

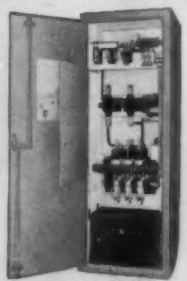


Bulletin 914 reduced voltage synchronous motor starter



Bulletin 922 low voltage synchronous motor starter

Bulletin 922 high voltage synchronous motor starter



Bulletin 1109 high voltage across-the-line starter

Bulletin 1146 high voltage squirrel-cage motor starter

9-55-MR

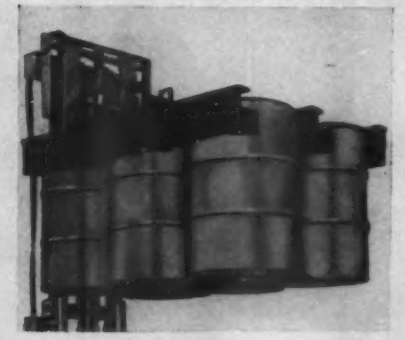
sitive turret attachments having the 2-in. ram.

Two sets of adjustable jaws cover range of tap squares from ⅞ to 2 in. and from 2 in. to 3⅛ in.

Models 125, 126, and 127 are mounted by means of No. 5, 6, or 7 Morse taper shank. These can be mounted directly in boring mills and radial drillpresses.

All models, with one set of adjustable jaws, are priced at $95.

*E F Vilter Co, 4161 N Richards St, Milwaukee 12, Wis.*

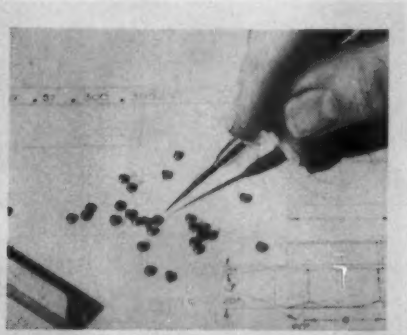


## Drum Clamp Attachment For Fork Truck

Empire attachment for fork truck lifts and conveys six drums at one time. Specially designed clamp drops over drums, pinches them in place, and raises load through normal lift of truck. 650-lb clamp can be used with any standard fork-lift vehicle, according to manufacturer. Clamp arms are said to increase capacity to 4000 lb.

Company also manufactures attachment for handling television cartons; 48-in. arms handle 2000-lb capacity.

*Iron Works, Inc, 116 King St, Brooklyn 31, NY*



## Self-Locking Micro Nuts Available in Miniature Sizes

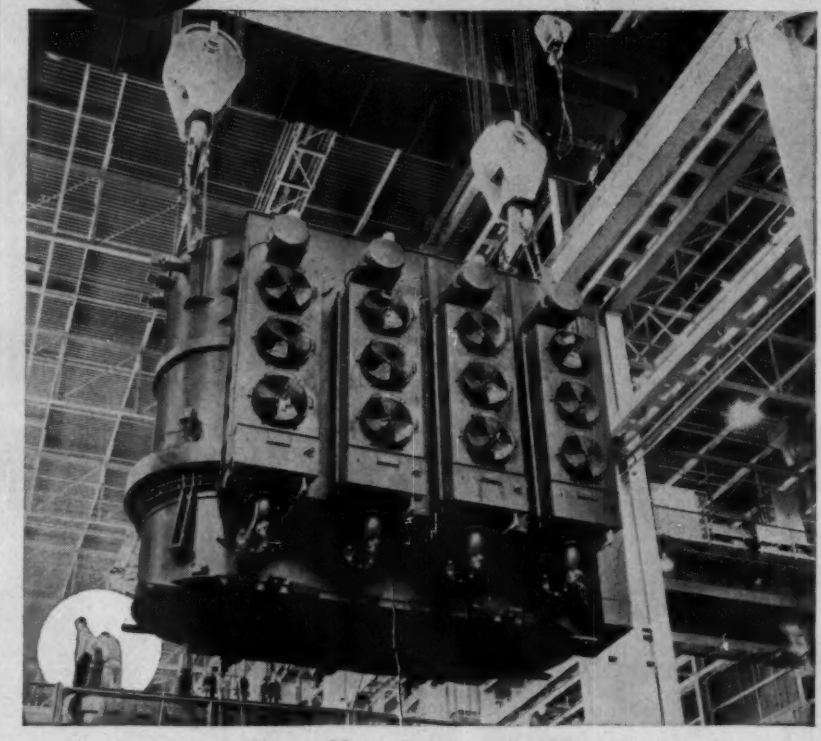
Line of miniature self-locking fasteners for precision instrument and

*(Continued on page 228)*


ACCO products

# ACCO Registered* Wire Rope Slings

THE STANDARD OF EFFICIENCY AND SAFETY



## You Can't Afford Not to Use Them!

• Materials handling is ticklish business. A dropped load can mean disastrous financial losses through ruined material and equipment, plus disrupted production schedules.

That's why more and more manufacturers are standardizing on ACCO *Registered* wire rope slings for all lifting operations. For ACCO *Registered* slings incorporate extra safeguards which make them the safest slings available.

Each individual component, made from the highest quality material suited to its use, is tested before assembly—must prove to have strength equal to or greater than the sling body. These components are then assembled into slings according to precisely engineered designs which have proven their safety and reliability in extensive field tests.

Each completed sling is then proof-tested at twice the load-carrying capacity for which it is rated. Then and only then does it receive the coveted registration certificate and tag.

Compare this rigorous quality control, precise design and manufacture, and extensive testing with the necessarily hit-or-miss methods used in producing "home-made" or hand-assembled slings. You'll see why ACCO *Registered* wire rope slings are safer.

And ACCO *Registered* slings cost less to use. Carefully engineered and precisely manufactured, they last longer, reduce overall lifting costs.

Get the details on ACCO *Registered* wire rope slings from your distributor, or call the nearest ACCO district branch below.

**FREE SLING NOTEBOOK**

Fifty-six page booklet includes data on sling use, tips on sling care, rated capacity information on all types of wire rope slings. *Write today for your copy.*

*Trade Mark Registered

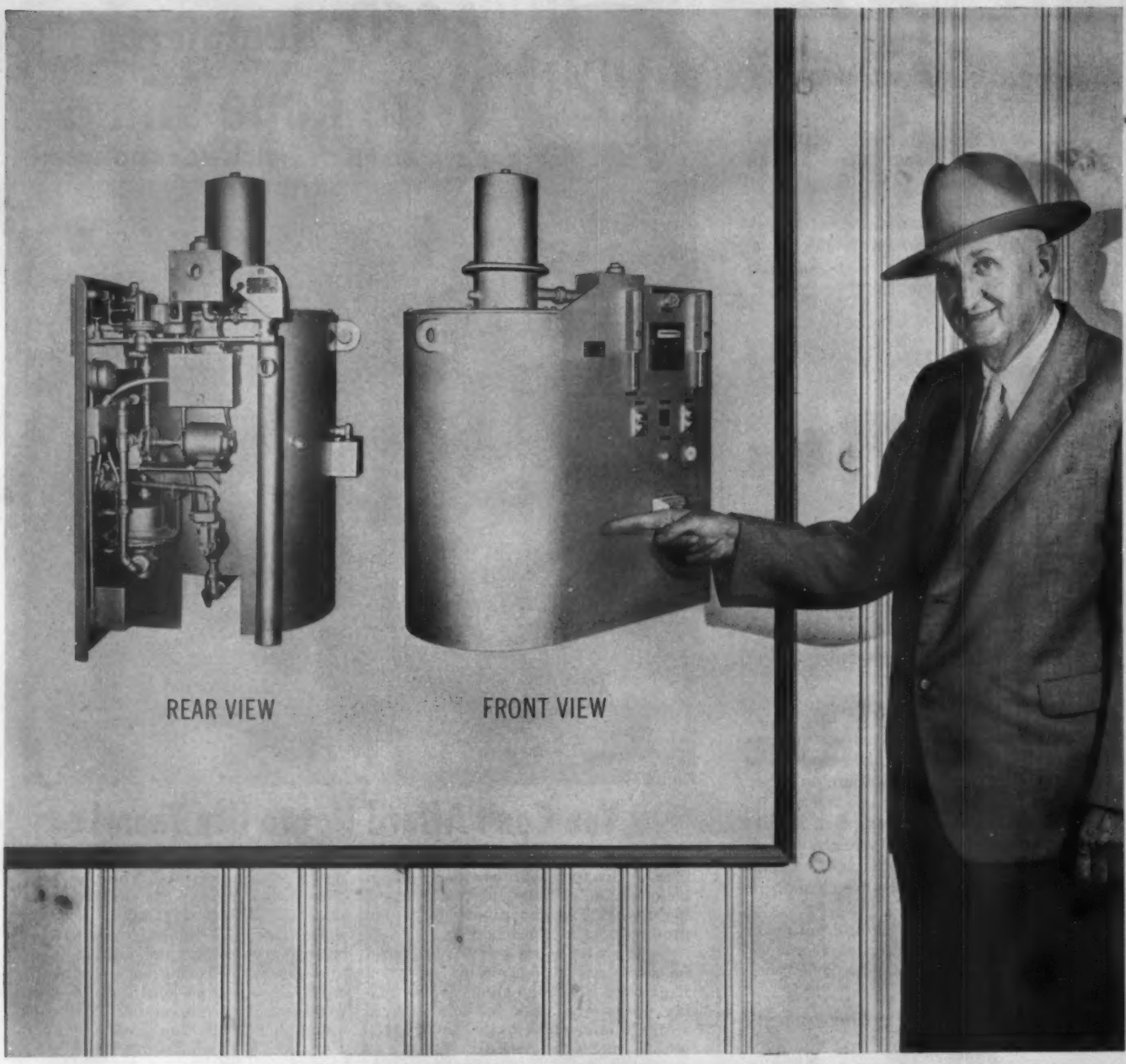
ACCO

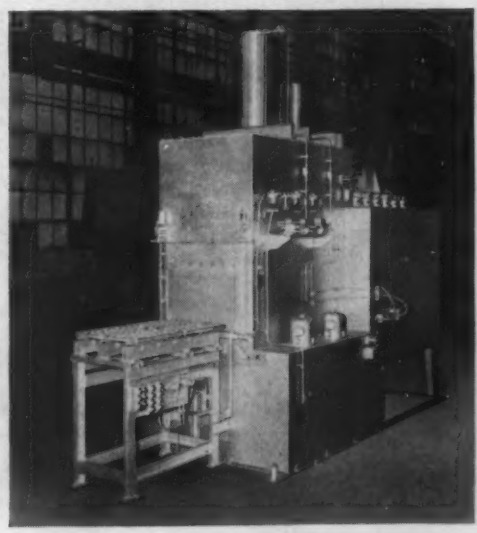
TRADE MARK

**Wire Rope Sling Department**
**AMERICAN CHAIN & CABLE**

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. • In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value



New Endogas generators match the complete Westinghouse line of toolroom furnaces from box-type (right) to multi-purpose (left).

Claud S. Gordon unveils

# Westinghouse new Endogas® generator

## For atmosphere flexibility over the entire range of Endogas to Exogas®

Now, with only one atmosphere generator, you're able to produce the complete range of atmospheres available from any fuel gas. Actually this new Endogas generator can help you expand production. For example, it is easily adjusted to supply several furnaces, one at a time, with atmospheres for either annealing, tempering, clean-hardening, brazing, sintering or gas carburizing.

After considering these operating advantages and the trim, functional design of this new unit, look at these important laborsaving features, too. The Endogas generator is shipped completely assembled, ready for easy installation. Maintenance is quick and simple. The removal of a few bolts from the flanged retort cap exposes the heating chamber and retort for quick inspection of the catalyst. For accurate atmosphere analysis and control, a mixing pump and balancing regulator automatically maintain gas pressure and ratio.

But to get the full story of the new Endogas generator, call any Claud S. Gordon Company representative. In areas where you cannot reach him, call the local Westinghouse Sales Office, or write Westinghouse Industrial Heating Division, Meadville, Penna. J-10446

YOU CAN BE SURE...IF IT'S

Westinghouse

## "Heat-treating answers are our business."

**Claud S. Gordon tells why his broad experience and facilities back, exclusively, the complete Westinghouse toolroom furnace line.**

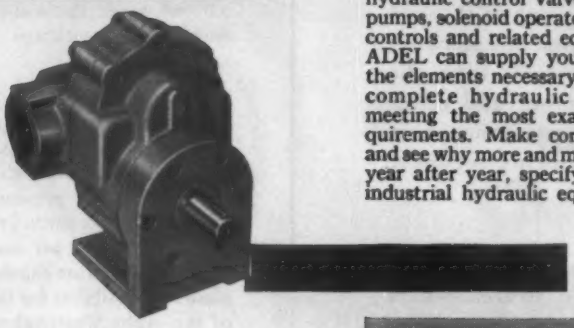
Our company is now approaching its forty-second year of helping customers improve heat-treating facilities. During this time our experience in applying all types of furnaces has given us an appreciation for the sound design and engineering of Westinghouse equipment. We look forward to passing on to you the many improvements in the Westinghouse toolroom furnace line and plan to tell you more about the developments still in test stage.

In addition, the Claud S. Gordon Company will continue the manufacture of thermocouples, insulated wire and other thermocouple supplies, as well as pyrometers. Our competent sales force averages 10 years' experience per man. Any of these engineers are capable of complete responsibility for installation of the right Westinghouse toolroom furnace, control and testing equipment for you. Thus we assure you of a complete job from engineering to installation. Claud S. Gordon Company, 3000 S. Wallace Street, Chicago, Illinois.

# ADEL

**A COMPLETE LINE OF INDUSTRIAL HYDRAULIC EQUIPMENT FOR EVERY APPLICATION**

For fourteen years ADEL has continuously directed its energies to the advanced development and production of high-quality hydraulic equipment. With the most modern facilities in our 150,000 square foot plant, we build ruggedness, efficiency and compactness into each ADEL unit. The variety of equipment being manufactured has been steadily expanded until today it encompasses a complete line of hydraulic control valves, power pumps, solenoid operated remote controls and related equipment. ADEL can supply you with all the elements necessary to build complete hydraulic systems meeting the most exacting requirements. Make comparisons and see why more and more users, year after year, specify ADEL industrial hydraulic equipment.



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ADEL DIVISION
OF GENERAL METALS
CORPORATION,
10767 Van Owen St.,
Burbank, California

ADEL
PRECISION PRODUCTS
A DIVISION OF GENERAL METALS CORPORATION

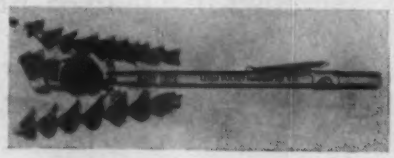
Manufacturers of Industrial Hydraulic Valves and Pumps

**DISTRIBUTORS:** AIR-DRAULIC EQUIPMENT CO., HOUSTON, TEX. • AIR & HYDRAULIC ENGINEERING CO., NEW HAVEN, CONN. • RUSS CHAMBERLIN COMPANY, PORTLAND 14, ORE. J. BOYD COATES, GLENSIDE, PA. • CORBY SUPPLY COMPANY, ST. LOUIS, MO. • FRANK T. DONNELLY COMPANY, PITTSBURGH 38, PA. • HASKEL ENGINEERING & SUPPLY CO., GLENDALE 4, CALIF. • HASKEL ENGINEERING & SUPPLY CO., SAN FRANCISCO 7, CALIF. • AIR-DRAULICS COMPANY, PHOENIX, ARIZ. • INDUSTRIAL AIR & HYDRAULIC EQUIP. CO., DETROIT 15, MICH. LINCOLN SUPPLY COMPANY, PROVIDENCE, R. I. • L. H. MONSEES, INDEPENDENCE, MO. • THE NEFF ENGINEERING CO., FORT WAYNE 3, IND. • POWER DRIVES, INCORPORATED, BUFFALO, N. Y. • SCOTT EQUIPMENT & ENGINEERING CO., DAYTON 10, OHIO • ROBERT TAYLOR & SONS, SALT LAKE CITY 10, UTAH • WYATT SALES COMPANY, CLEVELAND 15, OHIO
TRI-STATE SUPPLY COMPANY, BROOKLYN 33, N. Y.

electronic fastening applications ranges in size from 0-80 up to 4-48. The 0-80 measures less than ⅛ in. across its largest dimension.

The one-piece, all-metal fastener functions as a stop nut as well as a locknut. Slotted, locking collar, with segments turned in slightly during manufacture, is expanded as nut is tightened down on a threaded member. Spring-like pressure of the resilient collar segments reportedly holds Flexloc securely in place, whether seated or not, even under severe vibration. Locks anywhere on a threaded member as soon as locking threads are fully engaged. Micro nuts are currently available in brass, either plain or cadmium-plated, or aluminum.

*Standard Pressed Steel Co, Jenkintown, Pa*



**LEIGH PERMANENT MAGNET No. 434** is a pocket tool for removing loose metal from holes, identifying magnetic and non-magnetic materials, retrieving lost parts — *Spring Specialty Co, 23 North Fifth Ave, Maywood, Ill*

## New Tapping Unit

Fully automatic leadscrew tapping unit, Model TU-415, has been especially designed for single or multiple spindle precision tapping on special machines. Compact assembly is completely self-contained, and may be mounted in any position. It is furnished as standard with a flanged quill and slotted spindles for close-coupled multiple spindle tapping heads. Brackets provide rigid support for guide bars and the multiple head. Model is also available without the quill flange and with a 1-in.-bore adjustable adapter spindle for single spindle tapping.

Unit is equipped with limit switches at each end of the quill travel to provide protection against over-travel of the spindle. Tap protection against end thrust is provided by a construction feature which stops the spindle instantly should the tap enter an un-drilled hole. Stroke length is fully adjustable from 0 to 4 in. Device can be completely reset in a few minutes.

All standard leadscrew pitches, from 6 to 32, are available from stock. Controls are built-in; revers-

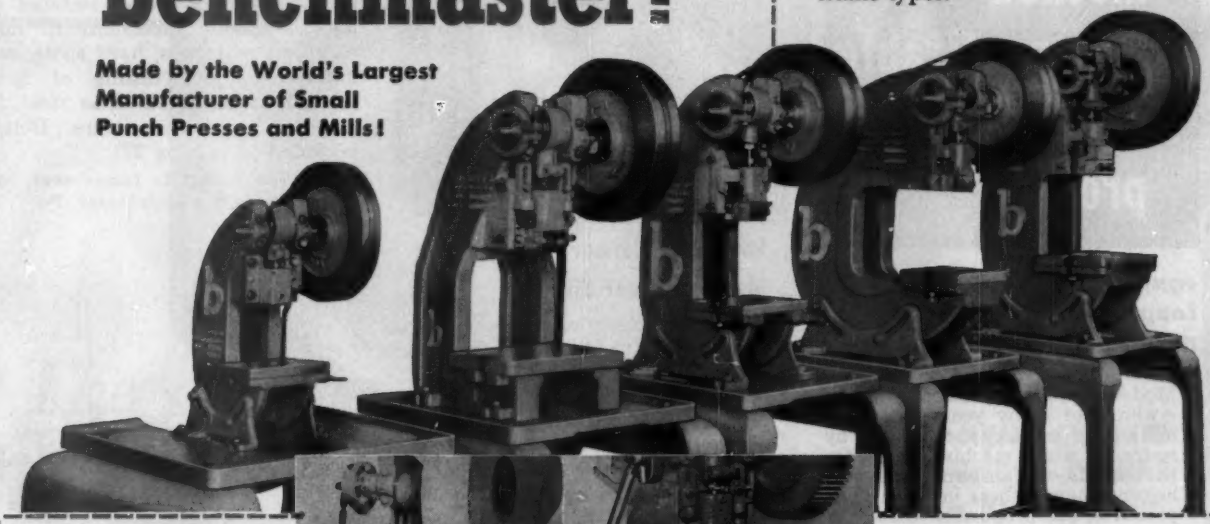
# For high production

## AT LOW COST

*...you can't beat*

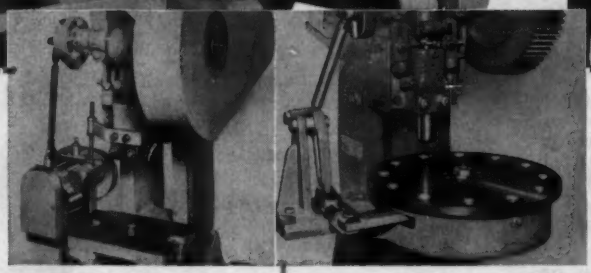
# benchmaster!

**Made by the World's Largest Manufacturer of Small Punch Presses and Mills!**



**benchmaster** **PUNCH PRESSES**

The most outstanding small presses in America and leaders for more than a decade! Now made in 2, 5 and 8 ton capacities. Many model variations for all manufacturing requirements... plain, back-geared, deep throat, half-presses and fixed-bed gap-frame types.



**benchmaster**
**AUTOMATIC FRICTION ROLL FEEDS**

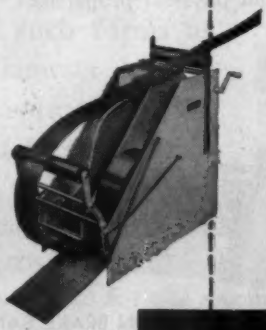
Lowest price on the market! Ideal for production work feeding small coil or strip stock. 3", 5", 7" and 9" roller widths. Two models, feeds adjustable from 0 to 3" cutoff or 0 to 6" cutoff. Plain, knurled or rubber covered rollers. Fits Benchmasters and other presses.

**benchmaster**
**ROTARY INDEX FEEDS**

Converts your presses for automatically *marking, crimping, assembling, reaming, trimming, etc.*, at speeds up to 6000 strokes per hour. Easy installation—4 bolt mounting. Two sizes: 12" or 15" tables, 10 or 12 stations. Larger sizes on special order.

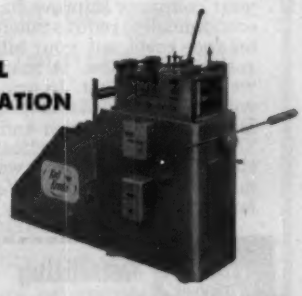
**benchmaster**
**KOIL KRADLES**

Supplies a slack loop from which any machine can draw. Takes the drag off automatic feeding devices, increases feeding accuracy on progressive or multiple die operations; puts through more footage per hour. Many sizes: 1200 to 4000 lbs., 36" to 60" coil diameters, 10" to 28" widths. Larger capacities available.



**benchmaster**
**KOIL KRADLE AND ROLL STRAIGHTENER COMBINATION**

Straighteners also available as single units. Feed rate variable 25 to 100 rpm, straightener thickness capacity .200". Other sizes available.



**benchmaster**

World's largest manufacturer of small punch presses and mills.

Benchmaster Manufacturing Co., 1835 N. Rosecrans Ave., Gardena, California

tough sprayed metal

# well-known maintenance method now profitable production process

***equipment fabricators find tough, high-quality sprayed metals build big bonus pay-offs***

Modern metallizing—metal spraying—which for many years has saved millions of maintenance dollars by restoring worn machine parts for thousands of companies, is now helping many others improve their products, cut production costs.

In the production of new equipment, tough sprayed metal coatings provide highly desirable mechanical or electrical characteristics at low cost, in high speed, semi-automatic production.

General Electric, for example, a long-time user of metallizing to provide superior wearing qualities on critical areas of large turbine shafting, now applies sprayed metals to a wide range of its products. Many forward-looking companies have instituted investigative programs in their research and design labs to explore the use of metallizing as a means of giving their products competitive advantages in quality, or performance or price—or all three.

Metallizing may be able to help your company improve its products, economically, reduce machine maintenance costs, cut your bills for corrosion protection. It may pay you well to look into it. In any event you will find it a fascinating subject. Bulletin 51 illustrates and describes "Metallizing—its practical applications"—shows actual work being done in users' shops. We shall be happy to send you a copy.

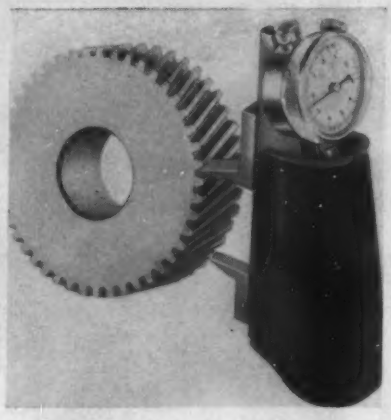
METCO®

**Metallizing Engineering Co., Inc.**

1109 Prospect Ave., Westbury, L. I., New York
Telephone: EDGEWOOD 4-1300 • Cable: METCO
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. – Chobham near Woking, England

ing motor controller and initiating switch or pushbutton are all that is required to operate the unit.

*Wisconsin Drill Head Co, Butler, Wis*



## Span Dial Caliper Measures Gear Sizes

Instrument measures spur or helical gears having odd or even numbers of teeth, (up to 20 per minute) without need of master gears or accessory pins or balls. Caliper is designed for use with Span system of gear measurement.

Dial indicator reads pitch line (normal to the helix) backlash directly; also available to read base backlash directly. The 0.00025-in. indicator is recommended for 0-10-0; the 0.0001-in. for 0-5-0.

*Sensory Devices Co, PO Box 204, New Vernon, NJ*

## Metals Comparator Tests Ferrous & Non-Ferrous Materials

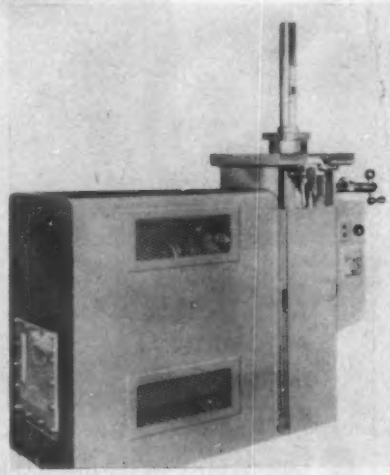
Instrument tests for composition, heat-treatment, hardness, case depth, plating thickness, and similar properties.

Unit is basically an impedance comparator, and will indicate changes in chemical and physical properties of a metal as these are correlated with the electrical and magnetic properties.

Small duplicate parts, or pieces with equal cross-sectional areas, are tested by insertion in a test coil. Test head, placed against the metal being measured, is used on surfaces of large equipment, or parts too big to be inserted in a test coil. Range of frequencies permits testing of both types of metals.

Special applications include sorting of over and under sintered alloys, magnetic inclusions in non-magnetic materials, hard spots, case differences, and testing of heat-treated welds of stainless steel for changes in microstructure. Details provided in catalog 27.

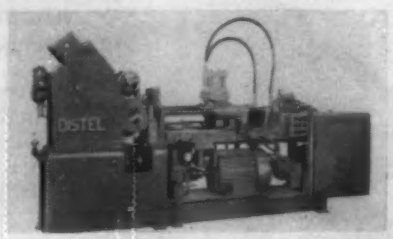
*Sunshine Scientific Instrument, 1810 Grant Ave, Phialadelphia 15, Pa*

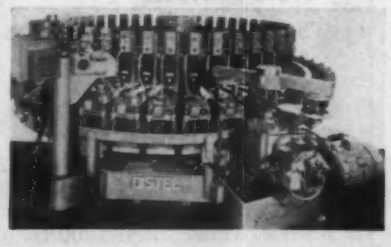


## New M & M Keyseater Has Hydraulic Action

Keyseater design announced by Mitts and Merrill features method of applying hydraulic action which is said to produce an exceptionally smooth performance. Cross-head of

*(Continued on page 234)*




AUTOMATIC TRANSMISSION BRAKE BANDS for automobiles are produced on two machines announced by Distel. 1st unit, roll form and cutoff machine which produces bands with diameters ranging from 6 to 10 in., receives, roll forms, and cuts off bands from coil stock. 2nd unit, brake band bonding machine, bonds brake linings to the steel bands by means of low-voltage electric heating elements. Production is 3600 brake linings per hour — *Distel Tool & Machine Co, 2585 Beaufaut, Detroit 7, Mich*

*The*
**NEW No. 3**

**PERMANENT EXHIBIT**
**WITH MACHINES UNDER POWER**
**. . . at 172 Stanley St., New Britain, Conn.**

# *Steinle* FORM GENERATING MACHINE

**. . . incorporating entirely NEW features as well as those which have been time-tested over 15 years in previous models.**

Designed for universal application and for the deep rolling of such forms as acme-threads, large diameter coarse pitch worms, gear teeth, splines and rod lengths of various thread forms.

Special features in this new machine include: automatic spindle reversing control for deep thread rolling; elimination of backlash in roll spindles and gear box to assure maximum precision; open top for non-obstruction to hopper feeding; an electronic timer for control of dwell period in order to eliminate ovality in forming.

The STEINLE line of Thread Rolling Machines includes three sizes to cover work from 1/8" to 3" diameter. Send prints or samples of your parts for our recommendations. New brochure on request.

*The Steinle* **MACHINE COMPANY**
**NEW BRITAIN** **CONNECTICUT**

## Bremen Bearings, Inc., uses SUPERLA

# Soluble Oil to give bearings the clean, cool treatment

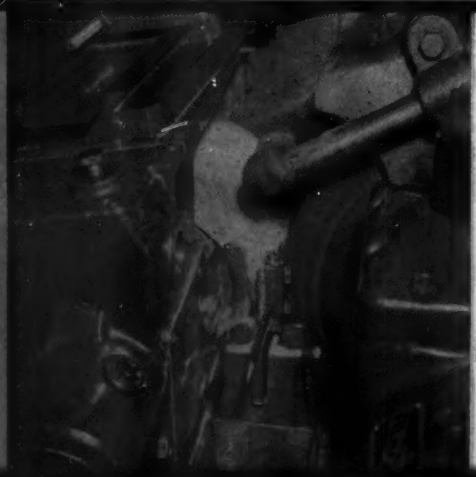
PRECISION NEEDLE BEARINGS are the exclusive product of Bremen Bearings, Inc., Bremen, Indiana. SUPERLA Soluble Oil is used exclusively in all eight of the Company's Cincinnati Centerless Grinders. Plant management experimented with various soluble oils before settling on SUPERLA. They found none could compare with SUPERLA Soluble Oil with respect to wheel loading, stability and tool machine cleanliness.

Plus these benefits, Bremen found SUPERLA mixed readily with water regardless of degree of hardness. The Company found, too, that they got longer tool life and maximum rust protection for work and machines.

You will have the same experience with SUPERLA Soluble Oil. Find out. Inquire of your Standard Oil lubrication specialist. In the Midwest call your nearby Standard Oil office. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

**Franklin D. Clark (right), Sales Manager, Bremen Bearings, Inc., and Standard Oil lubrication specialist E. A. Hunt, inspect needle bearing. Gene Hunt is well qualified to assist industrial plants on lubrication problems. In addition to his three years' experience in industrial lubrication sales work, Gene has an M. E. degree from Purdue and has completed the Standard Oil Sales Engineering School. Customers find this experience and training pay off *for them.***

**Bearings being ejected from Cincinnati Centerless Grinder at Bremen Bearings, Inc. The Company manufactures needle and spindle bearings to customers' specifications in sizes from 1/16 to ½ inch with tolerances of .0001" and finishes to 3 micro-inches. SUPERLA Soluble Oil is used on all of Company's grinding machines.**



STANDARD

**STANDARD OIL COMPANY**
(Indiana)

"From the punch press department. Shows how production climbed this year with Columbia EXL-DIE!"

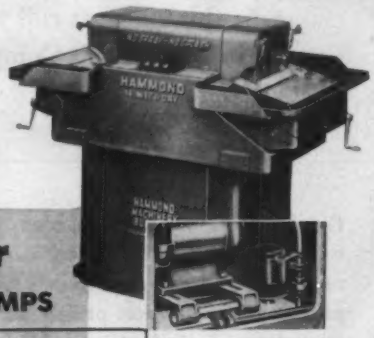
COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

COMPACT
•
CONVENIENT

Ruthman
Gusher
COOLANT PUMPS



Illustrated is a Hammond Model 14-WD Wet or Dry Carbide Tool Grinder — the inset shows a Gusher Coolant Pump mounted inside the base.

The compact, simple design of all Gusher Coolant Pumps assures you of maximum performance in a minimum of space. Wherever you mount it, a Gusher Coolant Pump is ready to go to work. There's no priming necessary, you get instantaneous coolant flow.

Gushers require little or no maintenance, the ball bearings are pre-lubricated. There is no packing to worry about and the rugged construction and dynamically balanced rotating assembly cut wear to a minimum. Always specify Gusher for your coolant needs.

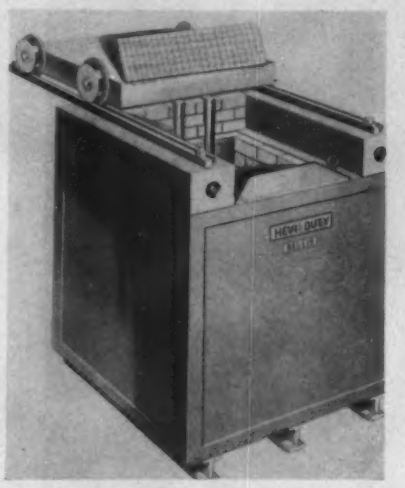
THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio


keyseater is actuated by a vane-type pump that produces a cross-head working pull of over 7000 lb on the No. 2 machine and 9500 lb on the No. 3.

No. 2 keyseater will cut keyways to predetermined lengths up to a maximum of 12 in.; No. 3 machine has a maximum of 15 in. Stroke and feed of cutter are automatically controlled, and tool relief is also automatic.

*Mitts & Merrill, Saginaw, Mich*



## Immersed-Electrode Salt-Bath Furnaces Have Water-Cooling

Furnaces are available in various sizes, from toolroom to high-rate production, are available with temperatures from 300F to 2400F. Immersed electrodes have water-cooled terminals, to prevent heat from reaching the transformer. Starter coil is of resistant-heater type. Ceramic, steel, or alloy pots can be removed without rebricking. Recessed electrodes permit use of rolling insulated cover, designed to minimize heat loss.

Bulletin 655.

*Hevi Duty Electric Co, Milwaukee 1, Wis*

## HVUT Speed Reducer For Conveyor Drives

Combination helical and worm gear speed-reducer drive was developed for use in overhead, trolley, floor and pit-type conveyors. Unit is mounted so that output shaft is horizontal or vertical to suit mounting conditions, with input shaft at horizontal right angle.

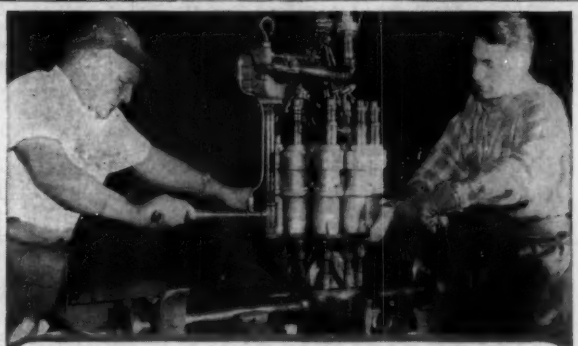
Reducers are available in wide range of output speeds. Ratios utilizing 50:1 standard worm gear and helical reductions run up to 1800:1. Changes in output speed can be

# Fast, Accurate Nut Setting with MULTIPLE SPINDLES

*Multiple nut setters bolt down cylinder heads in automobile engine assembly. Torque output of each spindle is individually adjustable.*

Where bolts or nuts can be run and tightened two or more at a time, Keller Multiple Nut Setters increase output and reduce costs. Even more important, they improve quality control by keeping torque within very close tolerances.

The automotive industry—and many others—are making extensive use of these tools. For detailed information contact your nearest Keller sales office. Descriptive Bulletin 16-101 sent free on request.



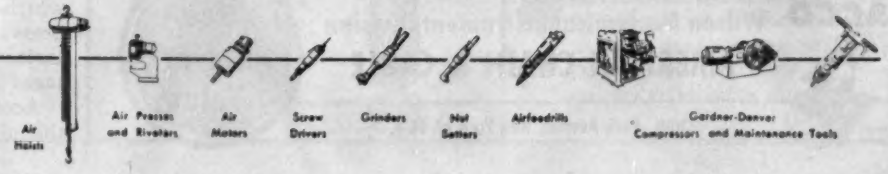
*Ten bolts are run simultaneously to attach axle carrier to differential housing. Accurate torque is vital because the joint must be leakproof.*

GARDNER-DENVER Since 1859 K KELLER TOOLS

**KELLER TOOL**

DIVISION OF **GARDNER-DENVER**

GRAND HAVEN, MICHIGAN



ACCO products

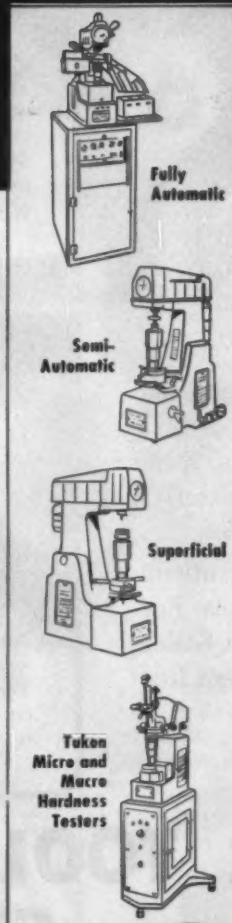
# Wilson "Rockwell"* Hardness Testers

**EASY TO USE**
as a scale

**SENSITIVE & ACCURATE**
as a precision balance

**DURABLE**
as a machine tool

3-JR MODEL
*Invaluable for tool room use and most production testing*




• WILSON "Rockwell" Hardness Testers were the first to combine in one high grade instrument the precision and sensitivity demanded in the metallurgical laboratory, the accuracy required in the tool room *plus* the ease of operation and durability for daily use on the production line.

Now the world's standard of accurate hardness tests since 1921, WILSON "Rockwell" Hardness Testers have developed to keep pace with the ever-expanding requirements of industry. Their testing scope and capacity has increased until their use in steel mills, non-ferrous mills and metal fabricating plants is universal.

*A staff of WILSON hardness-testing experts is conveniently located to check your needs with you—recommend just the size and model best suited to the job. Why not call or write today?*

*Trade mark registered

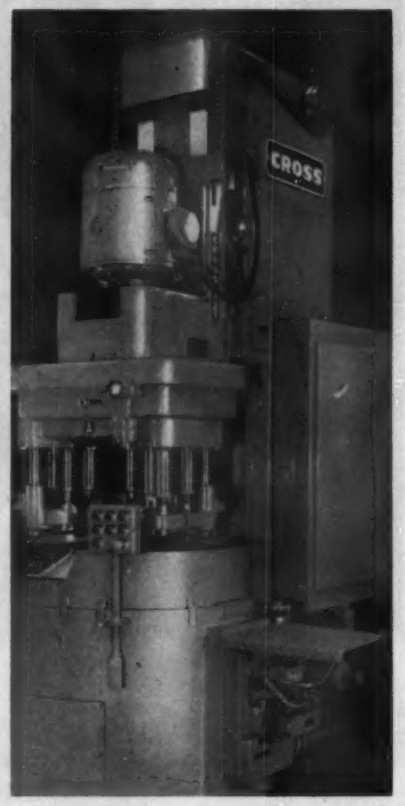
ACCO Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

for Better Value

made by changing helical gears within unit.

Standard features include completely enclosed housing and "dry well" construction to prevent oil leakage around output shaft. Units are available with mechanical-electrical shutoff devices for torque or overload protection.

*Philadelphia Gear Works, G St below Erie Ave, Philadelphia 34, Pa*




**CONNECTING RODS for air conditioning units are processed by machine with capacity for handling four rods with different center distances and machining two sizes in the same setup. Machine, a dial type with fluid-motor-operated index table, has three working stations, one loading and unloading. Operations include drilling—rough and finish—reaming wrist pins and crank-pin holes — *Cross Co, Detroit 7, Mich***

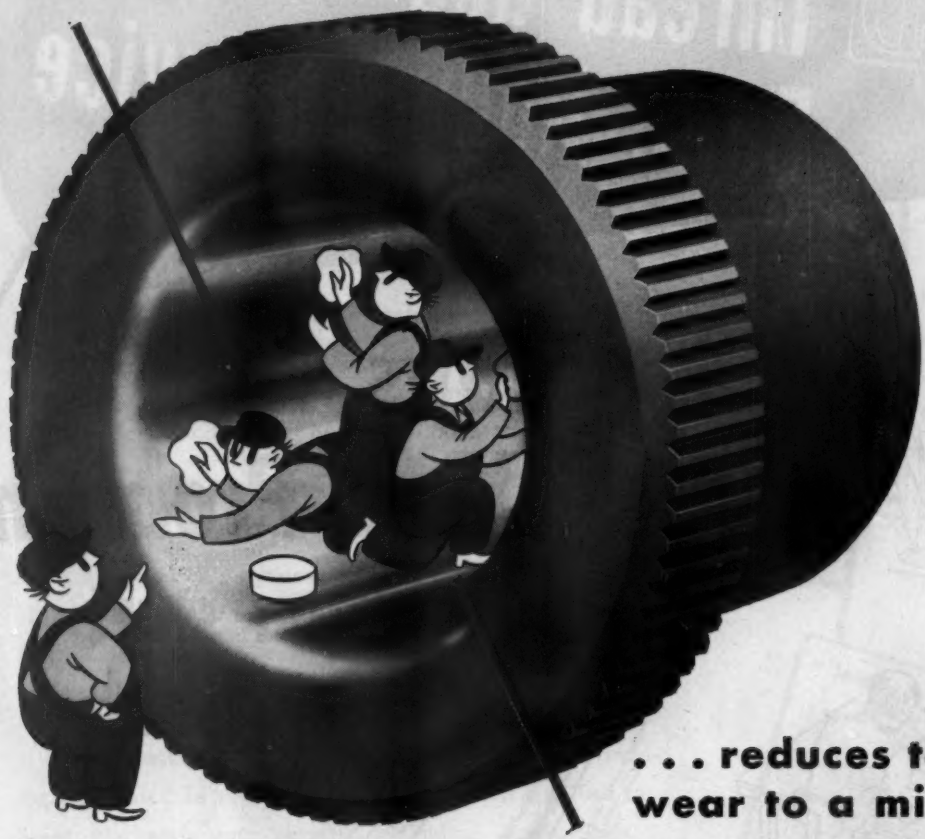
## Texaco Transultex B HD Is Transparent Sulfurized Oil

Transultex Cutting Oil B HD is a transparent, sulfurized product which is said to combine extreme-pressure characteristics of black sulfurized oils with production advantages of transparent materials.

According to the manufacturer, the oil was field-tested for a year

(Continued on page 241)

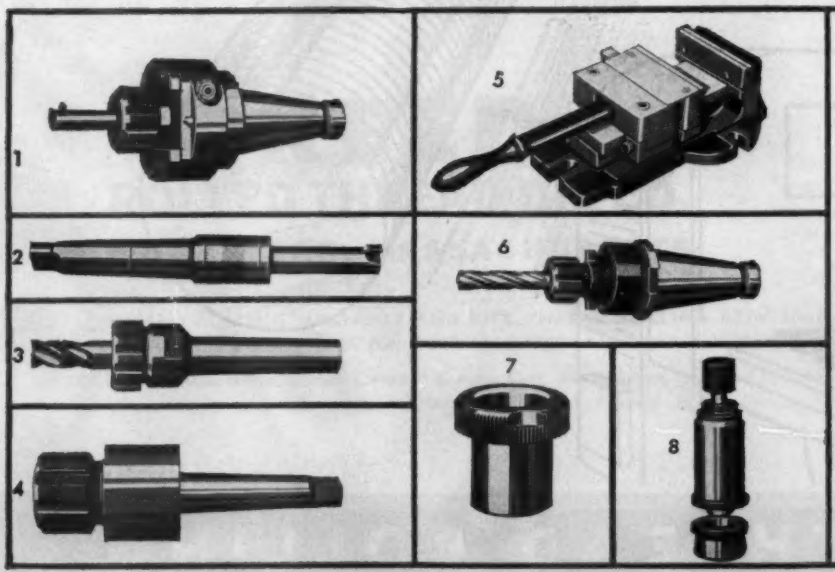
# SUPER FINISH OF UNIVERSAL DRILL BUSHINGS . . .



## . . . reduces tool wear to a minimum

One sure way to cut excessive tool wear in your operations is to specify Universal Drill Bushings because their superfinish bores help reduce wear on production tools to an absolute minimum, especially in close tolerance work. The blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy, uniform high quality and long life. Knurled heads provide a quick, sure grip. Universal Drill Bushings are produced in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N.J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

170



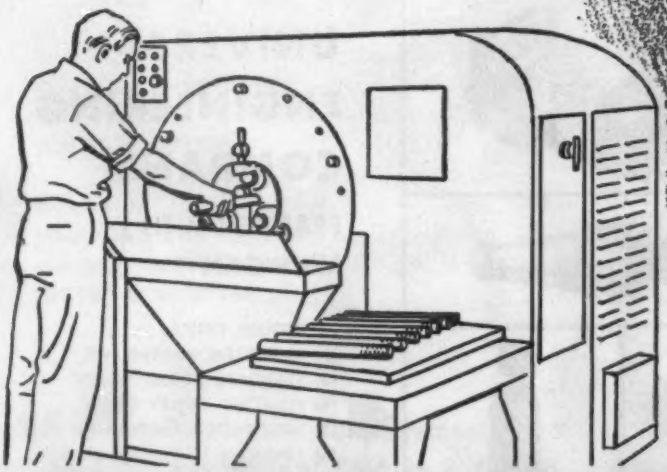

## UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1
MICHIGAN

(1) BORING CHUCK
(2) MIKRO-LOK BORING BAR
(3) STANDARD COLLET CHUCK
(4) FLOATING COLLET CHUCK
(5) WEDGE-LOCK PRODUCTION VISE
(6) "KWIK-SWITCH" TOOL HOLDER
(7) STANDARD DRILL BUSHING
(8) UNIVERSAL INDEX PLUNGER

REED RTD Co

# Thread and Form Rolling Service



## *Stays with Your Problem*

**from start to finish**

**IF IT'S THREAD ROLLING .**

# Here is help that counts when you need it most

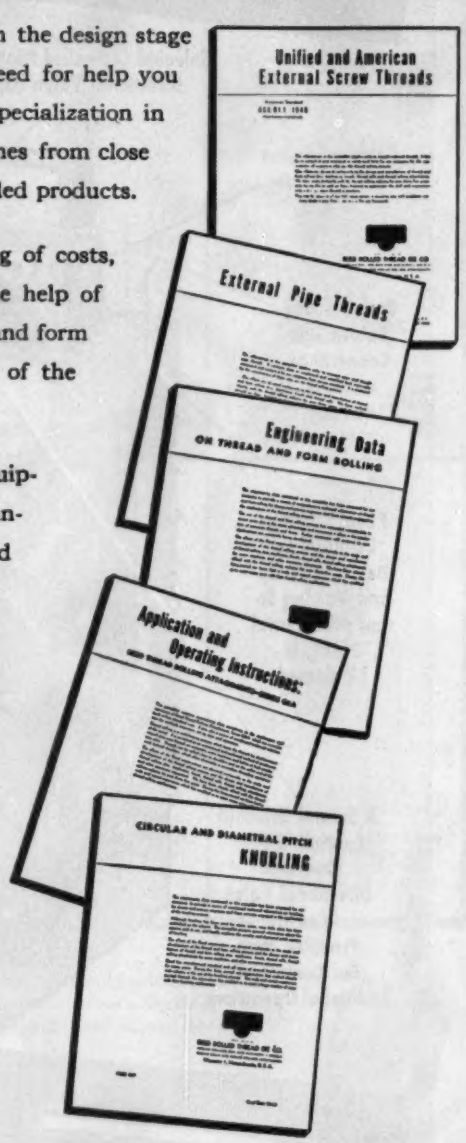
Reed's thread and form rolling engineers work with you from the design stage through to the final production run. When you depend on Reed for help you will have the advantage of more than thirty-five years of specialization in thread and form rolling development. Reed's experience comes from close teamwork with designers and producers of formed and threaded products.

Problems we have solved repeatedly include the lowering of costs, increasing production rates and improving quality. With the help of the Reed experimental rolling department many new thread and form rolling applications have been developed to the advantage of the producer.

Through Reed's program of continuing basic research, equipment and tools are continually being improved and the advantages of the thread rolling process extended. In addition, Reed has facilities for the design and manufacture of special tools and completely automatic equipment.

If you want help, look up your nearest Reed representative, located in principal cities. He is well qualified to assist you with your external threading applications. Skilled service personnel will help you with the installation of Reed tools and equipment and show you how to use them to your best advantage.

Let Reed start with your problem . . . stay with your problem until it is no longer a problem.




Reed's engineering library, including our own comprehensive technical publications, covers all phases of thread and form rolling, thread specifications and standards. Our technical publications are available to you on request.

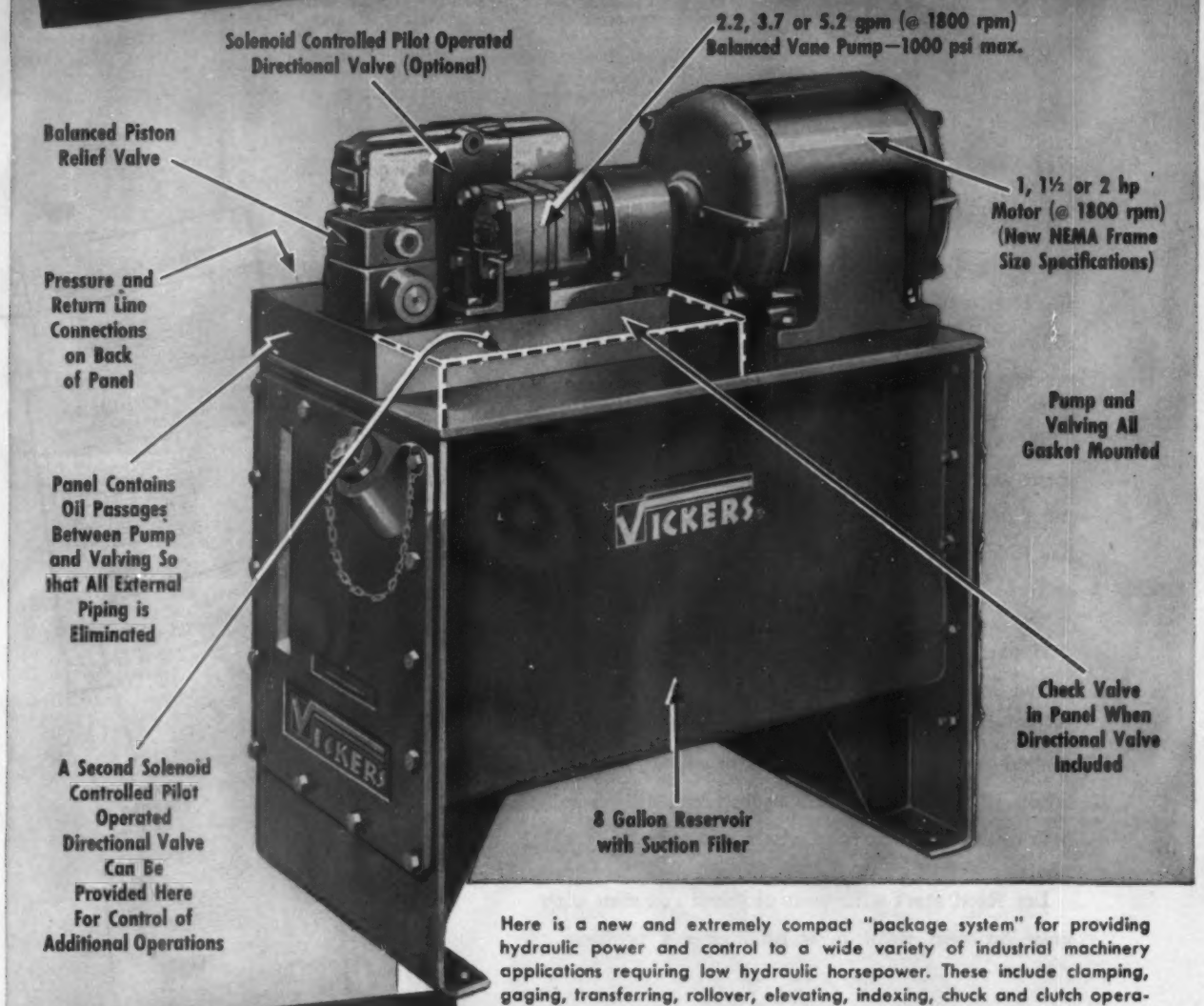
# REED
## ROLLED THREAD DIE CO.
## WORCESTER, MASSACHUSETTS

**THREAD ROLLING MACHINES AND DIES, THREAD ROLLING ATTACHMENTS, THREAD ROLLS AND KNURLS FOR AUTOMATIC SCREW MACHINES AND TURRET LATHES**

Sales Offices In: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Philadelphia, Pittsburgh, St. Louis, Syracuse, Toronto

**. . . COME TO SPECIALISTS**

# A NEW IDEA . . . in hydraulic power and control systems


Solenoid Controlled Pilot Operated Directional Valve (Optional)
2.2, 3.7 or 5.2 gpm (@ 1800 rpm) Balanced Vane Pump—1000 psi max.
Balanced Piston Relief Valve
1, 1½ or 2 hp Motor (@ 1800 rpm) (New NEMA Frame Size Specifications)
Pressure and Return Line Connections on Back of Panel
Pump and Valving All Gasket Mounted
Panel Contains Oil Passages Between Pump and Valving So that All External Piping is Eliminated
VICKERS
Check Valve in Panel When Directional Valve Included
A Second Solenoid Controlled Pilot Operated Directional Valve Can Be Provided Here For Control of Additional Operations
8 Gallon Reservoir with Suction Filter

VICKERS®
Series T8
HYDRAULIC
PIPELESS
POWER PACKAGE*

7311

Here is a new and extremely compact "package system" for providing hydraulic power and control to a wide variety of industrial machinery applications requiring low hydraulic horsepower. These include clamping, gaging, transferring, rollover, elevating, indexing, chuck and clutch operations, etc.

Note the many features indicated on the photograph above. The result is improved and simplified hydraulic design . . . also reduced installation and maintenance costs. This "package system" has great flexibility . . . is available in a wide variety of combinations of standard components assembled to suit individual requirements. Pretested and ready for immediate operation, it has also the advantage of undivided Vickers responsibility. For further information, ask for installation drawings 178706-8.

**VICKERS INCORPORATED**
*DIVISION OF SPERRY RAND CORPORATION*
**1410 OAKMAN BLVD. • DETROIT 32, MICH.**

*Application Engineering Offices:* • ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • HOUSTON • LOS ANGELES AREA (El Segundo) MINNEAPOLIS • NEW YORK AREA (Summit, N.J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WASHINGTON • WORCESTER

IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

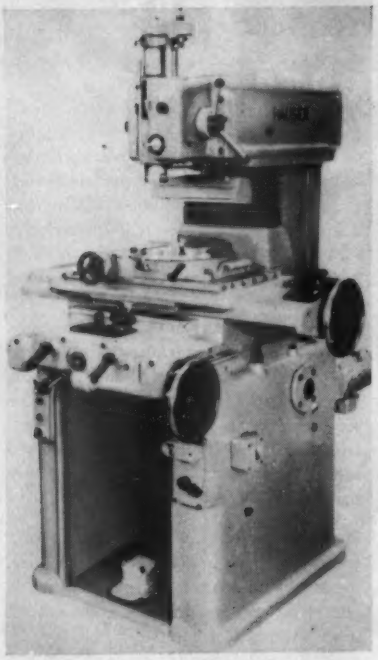
*These "package systems" supplement the Vickers line of standard hydraulic power units.

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

in such work as internal broaching, cutting Acme threads, high-speed threading, and on stainless steel and automatic screw machines.

Benefits claimed include easier inspection of work in progress and finished parts, less cleaning time, and more accurate work because the parts are visible during machining.

*The Texas Co, 135 E 42nd St, New York 17, NY*



## Precision Jig Borer In Improved Model

Hauser Model 3BA jig borer incorporates changes in company's 2BA machine. Unit is said to have greater boring capacity, height adjustment, and table travel; heavier quill; and larger table surface. Specifications: working surface, 21¾ x 12¾ in.; longitudinal travel, 15¾ in.; transverse slide travel, 10 in.; vertical spindle travel, 5⅛ in.

Standard equipment includes dial indicating locator, locating microscope, and drill guide attachment.

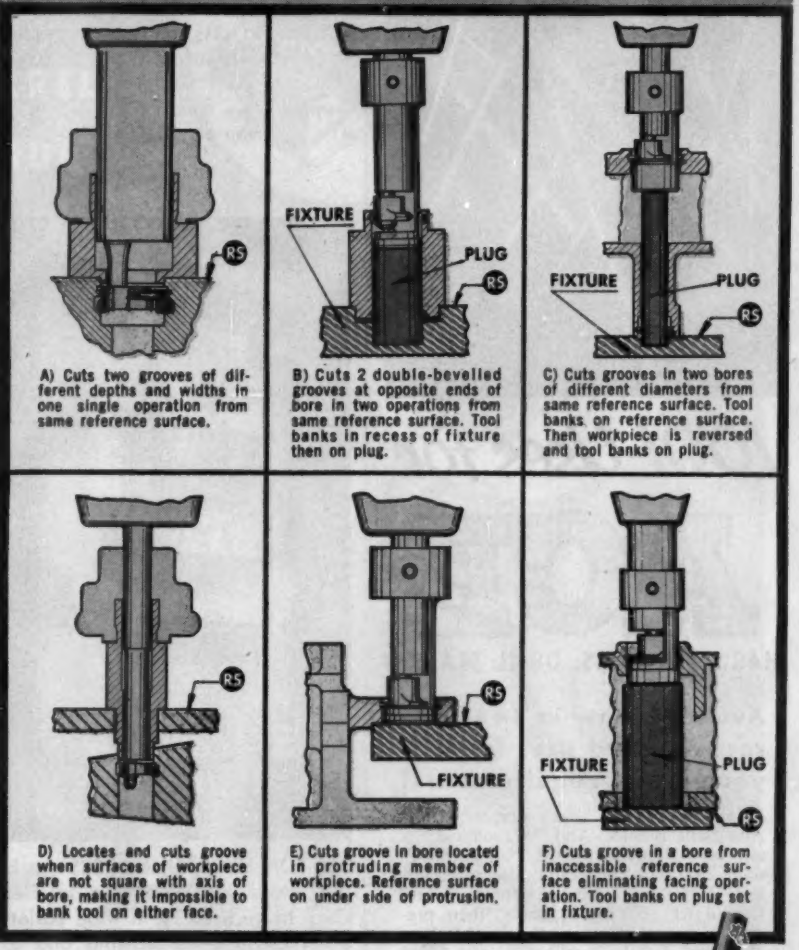
*Carl Hirschmann Co, 30 Park Ave, Manhasset, NY*

## Universal Grinding Head Is Infinitely Adjustable

Grinding head termed Multi-Spiral is designed for use with cutter grinders, surface grinders, and milling machines. Unit has universal motion in an infinite number of directions, can be used for sharpening almost any type of cutting tool.

Spindle motion is adjustable


**Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!**




A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

**Amazingly versatile!** Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

**Wide Cutting Range!** The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

**Send Your Problems to Waldes!** Send us your blueprints...let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truarc Grooving Tool

WALDES TRUARC® GROOVING TOOL

Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.

Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,411,426

AM127

Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.

Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

straight in and out on straight line with center line of spindle. With spindle moving in and out, head can be set to move at right angles to spindle motion, so that tapers can be ground. Head grinds end mills, standard and long, from ⅛ to 1¼-in. dia; accommodates spiral milling cutters to 2½-in. wide; performs wide variety of other grinding operations.

*Spiral Step Tool Co, 5404 N Damen Ave, Chicago 25, Ill*

**750-TON HYDRAULIC PRESS** has been purchased by Westinghouse Electric Corp to be used for a wide variety of sheet metal deep-drawing and forming operations. 48-in. main ram stroke is capable of making 21-in. deep-drawn parts. Bed size is 84 x 72 in; press is equipped with 250-ton blankholder and 150-ton hydraulic die cushion. Weight is approximately 200,000 lb—*Hydraulic Press Mfg Co, Mount Gilead, Ohio*

## Portable Fire Extinguishers

Kidde wet-chemical portable fire extinguishers are available in line which includes pressurized and brass-container units. Typical is 2½-gal. pressure-operated water and anti-freeze extinguisher; because of its tin-lined, brass-container construction, extinguisher is non-corrosive. Charging pressure is only 100 psi.

1-qt., 1½-qt., and 1-gal. carbon tetrachloride and chloro-bromomethane extinguishers are pressurized

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ACE

HARDENED H.S.S. DRILL BLANKS!

**Available now in 148 low-cost standard sizes to meet your exact requirements!**

"*Versatile!*" Yes, that's one word for Ace Drill Blanks. And "*economical*" is another. Because they're "all-purpose" tools that you can readily use in countless different ways. Properly heat-treated to uniform hardness, then precision ground to size, they're ideal as punches, dowels, knock-out pins, and gages. Perfect for rollers, too, on high temperature applications. And you'll find they can be quickly, easily, economically adapted to a wide range of end-cutting tool applications to save time, step up production, and reduce costs! Call your local distributor . . . or send for complete information today!

ACE DRILL CORPORATION
Adrian, Michigan

Gentlemen: Please send me your Catalog No. 52-A containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

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ADDRESS_____

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ACE DRILL
ADRIAN, MICHIGAN
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS



HEAT TREATING as an INDEX

*F. J. Sorensen*

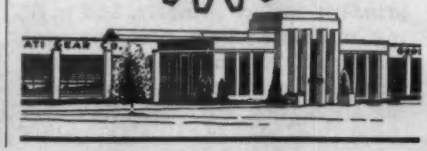
—CHAIRMAN, THE CINCINNATI GEAR CO.

The continuing demand for improved quality in gearing used throughout industry is closely reflected, we think, by the yearly increase in the percentage of our gear output that is scientifically heat treated and specially hardened. This constant pressure for better, tougher, quieter gears carries over into all phases of their manufacture. Gone are the days when a gear was simply any old blank with some teeth cut in it. Even in the past 15 years the change has been dramatic. The necessity to meet steadily increasing requirements in pitch line velocity and stresses has dictated better steels, closer tolerance, more critical tempering and hardening.

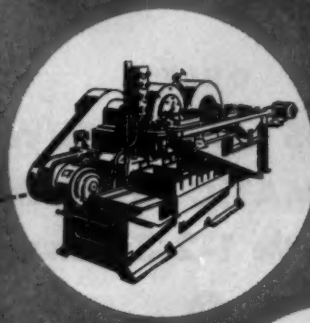
Heat treating is, in fact, one of our fortes. We have in conjunction with our modern gear manufacturing facilities a complete heat treating plant second to none in the gear industry. Because we are not dependent on outside sources for our heat treating, we obtain obvious advantages in delivery and cost as well as in quality. This is one big reason why we have earned such an enviable reputation for consistently high quality custom gear work, regardless of the requirements. And it is a typical indication of our continuous year-in and year-out efforts to supply gears that meet industry's most exacting demands.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
"*Gears—Good Gears Only*"

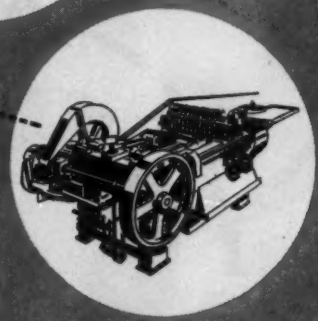
CINTI

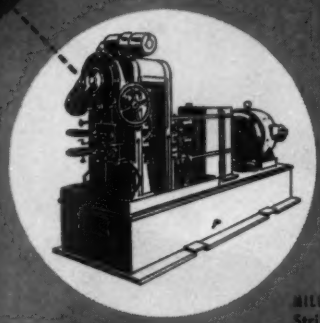


# 5 KINDS OF WATERBURY FARREL ANSWERS TO YOUR MASS PRODUCTION PROBLEMS



COLD PROCESS BOLT & NUT MACHINERY — Headers (all types) • Rivet Machinery • Trimmers • Thread Rolling Machines • Slotters • Nut Formers and Tappers, etc.

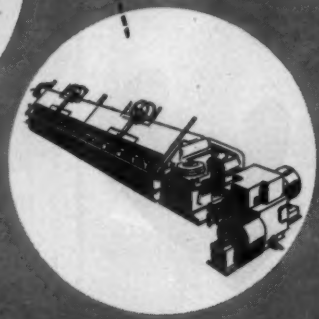




POWER PRESSES—Crank, Cam and Toggle; also Rack and Pinion Presses • Eyelet Machines • Multiple Plunger Presses • Horizontal and Hydraulic Presses, etc.

MILL MACHINERY — Rolling Mills: Strip, Rod, Wire Flattening, (For Ferrous and Non Ferrous Metals) • Also Slitters • Straighteners • Cut-off Saws • Coilers • Winders, etc.

SPECIAL MACHINERY — Sendzimir Mills • Small Arm Ammunition Machines • Collapsible Tube Machines • Coining Mills, etc.



WIRE MILL EQUIPMENT — Continuous Wire Drawing Machines (Upright Cone and Tandem) • Wire Flattening Mills • Chain Draw Benches • Pointers • Swagers • Bull Blocks • String-up • Machines • Spoolers, etc.

**Within These Basic WF Equipment Lines, Individual Machines Are Custom-Engineered For Specific Applications**

If your metal-working machinery problem falls into any of these five groups, there are good reasons for looking to Waterbury Farrel for the answer.

There's Waterbury Farrel's continuing engineering research with more than a century of machine building experience to draw upon. This results in soundly designed and thoroughly tested features which improve production.

There's Waterbury Farrel's world-wide reputation for rugged, long-lasting construction. This gives you the assurance that WF machines are built to provide long years of uninterrupted production.

Waterbury Farrel can custom-engineer special equipment or adapt a standard machine to fit your specific problem.

*For further information, write for free booklets on any of the machines mentioned on this page or contact your nearest WF office.*

**HERE'S A SAMPLE** of Waterbury-Farrel mass production equipment in action. This complete WF automatic production unit combines a 40-ton double-acting, upright blanking and cupping press, a conveyor feed and four 7-station horizontal drawing presses to draw 340 zinc shells per minute.

FOUNDED WATERBURY FARREL 1851

WATERBURY FARREL FOUNDRY & MACHINE CO. • WATERBURY, CONN.

Offices: Chicago, Cleveland and Millburn, N. J.

ONLY

GOSS and DELEEUW

AUTOMATIC CHUCKERS

offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

**The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.**

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.

The examples of work shown here are typical of the wide variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DELEEUW

GOSS and DE LEEUW

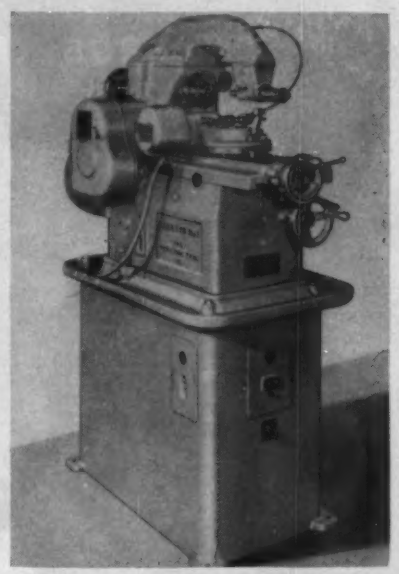
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

with either air or nitrogen to 150 psi. All pressurized extinguishers have safety latch which prevents accidental discharge.

Other additions to wet-chemical line are 2½-gal. and 5-gal. pump-tank-type extinguishers using either stainless steel or copper containers.

Containers on most extinguishers are of monodome construction, eliminating dome and side seams necessary in construction of stainless steel containers. All shells are tested to 500 psi.

*Walter Kidde & Co, Belleville, NJ*



## Hamilton Hobbing Machine No. 1 Adapts to Purchaser's Tooling

"Alternate" design for its No. 1 small gear, precision hobbing machine, a feature which is optional at no extra cost, adapts the unit to use of existing tooling regardless of style or make of hobbing machine for which tooling was constructed.

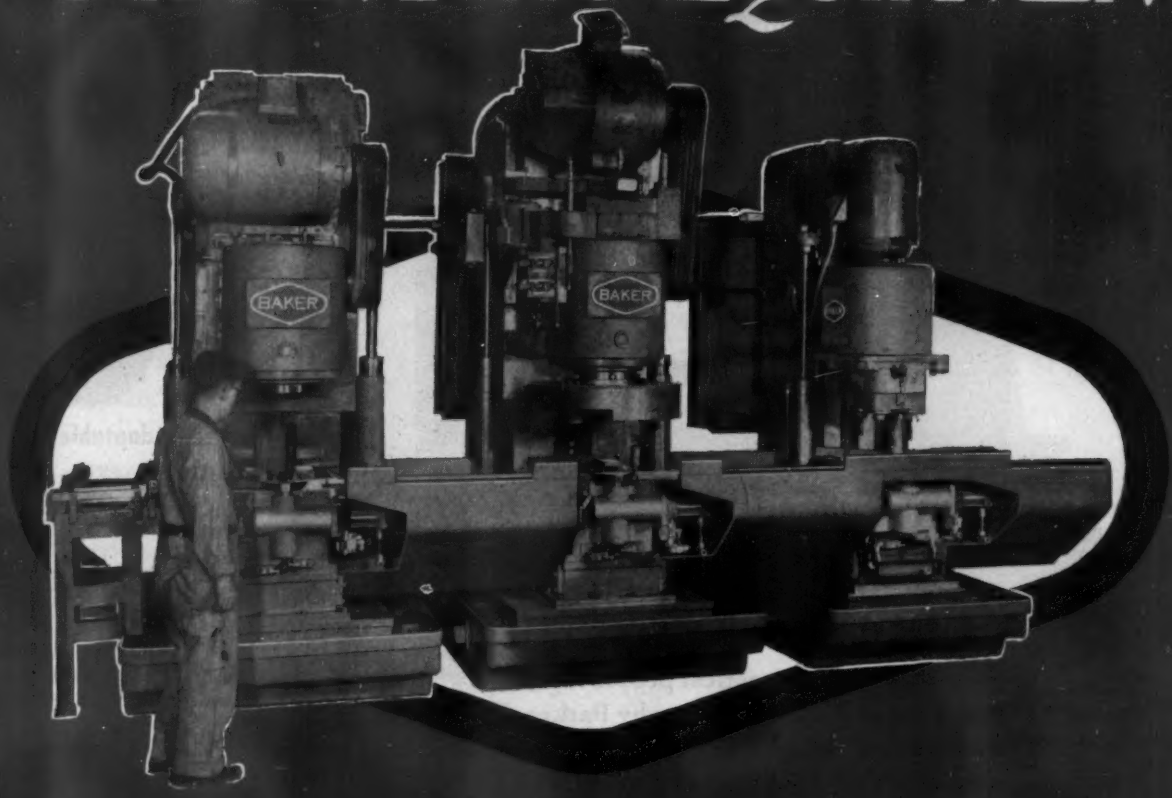
Development, according to the manufacturer, eliminates money loss occasioned by scrapping of existing workholding fixtures in order to acquire Hamilton hobber's independent selection of speeds, feeds, and indexing.

*Hamilton Tool Co, Ninth & Hanover Sts, Hamilton 4, Ohio*

## Vickers Check Valve Has 8-gpm Capacity

No. 4CG-03 check valve is gasket-mounted pilot-operated part for use with ⅜-in. piping in oil-hydraulic systems. Unit is of spring-closed, poppet-type construction, can be arranged in control systems to block

# The Average Shop Needs and Now Can Afford AUTOMATIC EQUIPMENT




The new three standard unit Baker Machine introduced at the show, is combined to operate as a transfer machine, set up with a low cost, simplified fixture, proving the possibility of providing automatic machines through use of STANDARD MACHINES . . . And thereby achieving automation without tremendous expenditure. Operations on the new Baker Transfer are Combination Bore & Counterbore . . . Face (cross feed) . . . and Multiple Drill . . . All Automatically. Write regarding your specific job problems.

BAKER

Standard and Special
Drilling . . . Boring . . . Tapping
Keyseating and Contour Grinding Machines

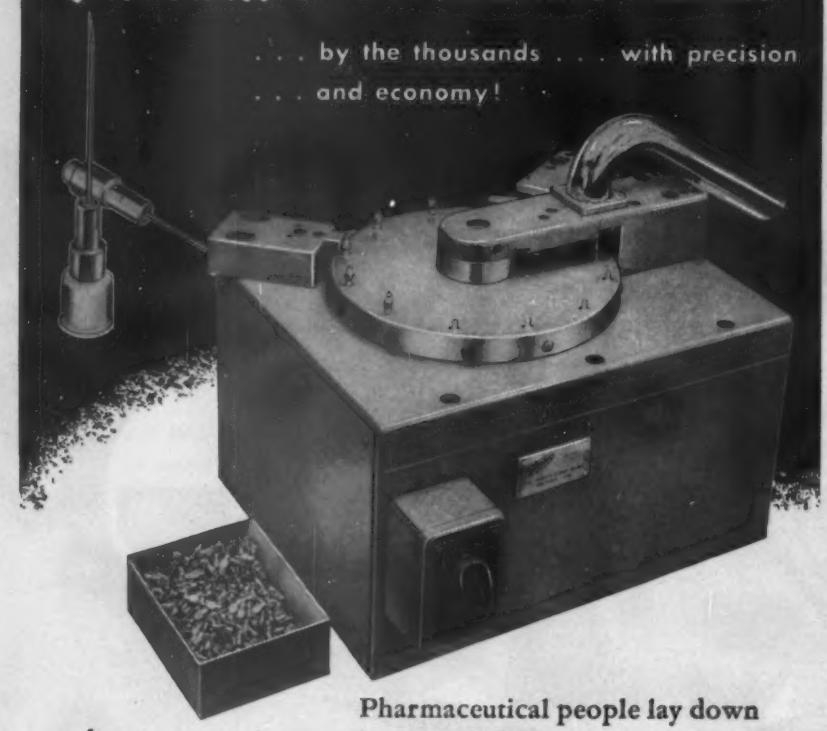
BAKER BROTHERS, INC.
TOLEDO 10, OHIO

SPECIAL MARKING MACHINES

by Parker

*Vaccinate* HYPODERMIC NEEDLES

. . . by the thousands . . . with precision
. . . and economy!



Pharmaceutical people lay down the most exacting requirements. That's why Parker was given the challenge to design and build this super-special marking machine. Dial operated, it marked 60 needle holders per minute—no trial and error—every impression perfect! That's our story. What's your problem? Parker can do the same for you.

*To protect your* **MARKET . . . Mark it!**

Send today for literature on the complete line of Parker marking machines and accessories.

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

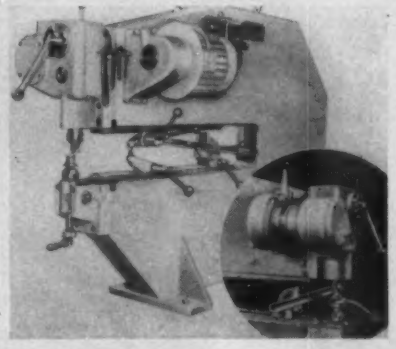
by Parker


flow in a given direction until opened by remotely applied pilot pressure and to allow free reverse flow.

Valve has rated capacity of 8 gpm and is recommended for use in systems with operating pressures up to 2000 psi. Unit requires pilot pressure greater than 40% of system pressure to open.

Available with either 30, 75, or 150 psi cracking pressure. Mounting subplate is also available.

*Vickers Inc, 1400 Oakman Blvd, Detroit 32, Mich*



## Pullmax Machine Adaptable To Many Operations

Pullmax Model P-7, a sheet metal and plate-working machine with stationary lower tool and reciprocating upper tool, has eight speeds and stroke lengths between 0.059 in. and 0.244 in. Attachments are available for straight or circular cutting, louver cutting, dishing, beading, joggling, edgebending, and freehand cutting.

Machine has an edge-cutting capacity of 9/32 in. in mild steel. Power is supplied by a 3-hp motor. A power feed device for moving metal through the cutting tools at speeds up to 20 fpm is available.

*American Pullmax Co, 2455 N Sheffield Ave, Chicago 14, Ill*

## American Machine Pumps Have Neoprene Impellers

Line of neoprene-rubber impeller pumps ranges from ⅜ to 1¼-in. iron pipe size with flow ranges to 55 gpm. Pumps were designed for use where low pressure unit is required to transfer any liquid that does not affect bronze or neoprene.

Pumps operate in either direction at low or high speeds. Impeller is replaceable at low cost and keyed to shaft for easy application. Casing is made of bearing bronze, shaft of stainless steel.

Unit is self-priming to 15-20 ft

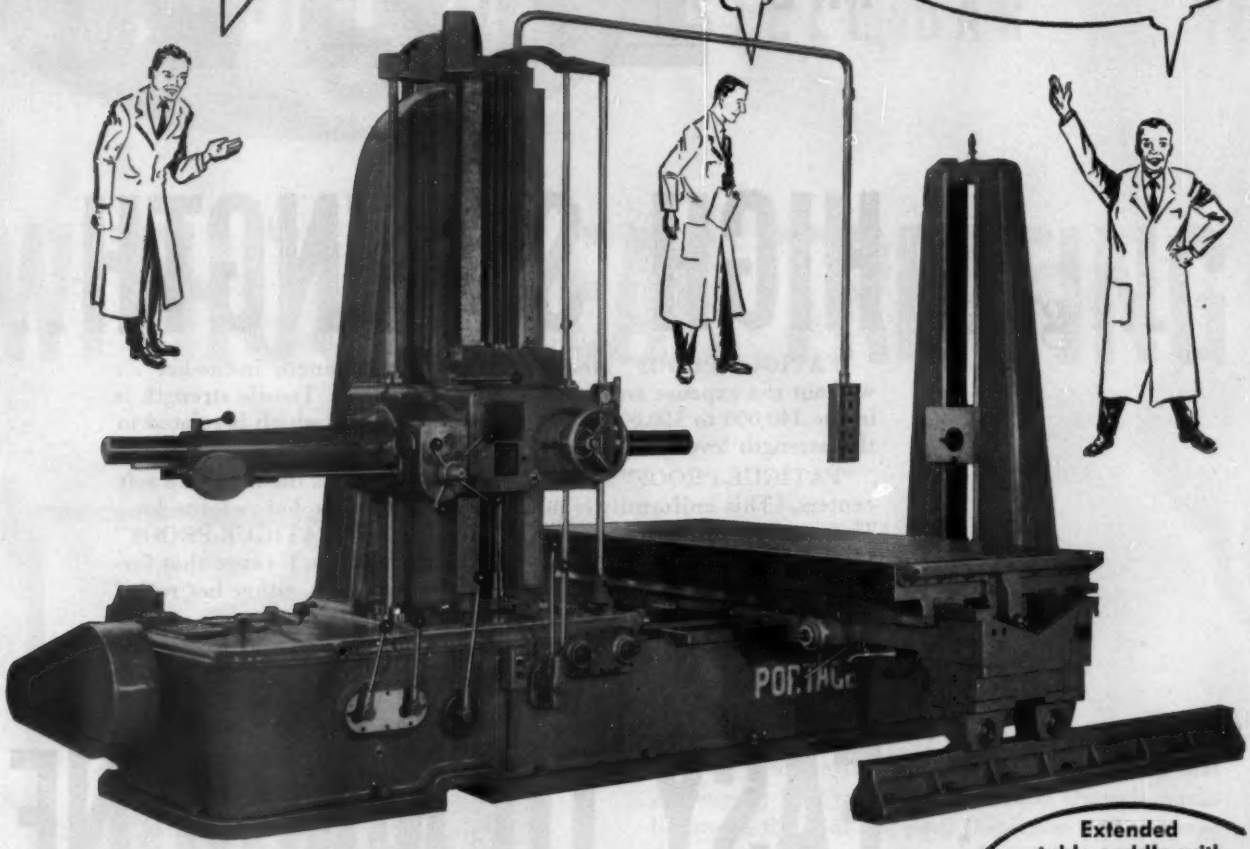
*(Continued on page 250)*

# CHECK THESE *Features...*

4" spindle diameter, precision machined nitralloy steel.

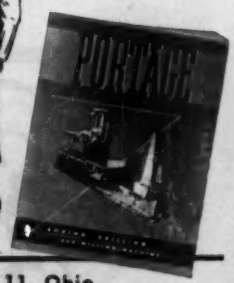
Pendent controls include spindle rotation, forward, reverse, jog forward, jog reverse and stop.

36 spindle speeds 8-1000 R.P.M. 18 Feeds.



Unusually wide and deep base, cast entirely in one piece . . . offers excellent rigidity.

Extended table saddle with adjustable supports and runways makes it possible to handle the big jobs, too!




**PORTAGE MACHINE PRICES START AT $31,358 COMPLETE.** The PORTAGE Horizontal Boring, Drilling and Milling Machine is a precision built tool. Only the finest of materials and workmanship go into its manufacture . . . and at a comparatively lower cost. Get ALL the facts . . . write for literature and specifications . . . *TODAY.*

PORTAGE

**THE PORTAGE MACHINE CO.**

1026 Sweitzer Avenue • Akron 11, Ohio

*Representatives in Principal Cities*

*BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916*

*another revolutionary development by La Salle*

THE **NEW**

**... gives HIGH STRENGTH...**

"FATIGUE-PROOF" steel bars offer high strength in-the-bar . . without the expense and trouble of heat treating. Tensile strength is in the 140,000 to 150,000 p. s. i. range . . hardness which is related to this strength level is approximately 30 Rockwell "C."

"FATIGUE-PROOF" has uniform strength across the bar . . no soft centers. (This uniformity is maintained from bar to bar . . lot to lot.) This remarkable uniformity of strength makes "FATIGUE-PROOF" ideal for applications in the 140,000 to 150,000 p. s. i. range that formerly required heat treated carbon and alloy steels, either hot rolled or cold drawn.

With "FATIGUE-PROOF" you'll get the advantages of heat treating . . none of the disadvantages. In short, you'll get a better part at lower cost.

**... yet it's EASY TO MACHINE**

"FATIGUE-PROOF" *is* a free-machining steel bar . . without question. It machines at least 25% faster than annealed alloys . . 50% to 100% faster than heat treated alloys.

"FATIGUE-PROOF's" excellent machinability permits faster speeds, heavier feeds, better tool life . . your production rates will increase . . you'll get more parts per hour.

Distortion from machining is held to a minimum . . there is no reduction of tool life due to the higher speeds and heavier feeds . . and surface finish is greatly improved.

*La Salle* **STEEL CO.**

**1416 150th Street, Hammond, Indiana**

*Manufacturers of America's Most Complete Line of Quality Cold-Finished Steel Bars*

# fatigue-proof STEEL BAR

# WITHOUT HEAT TREATING

- *no quench cracks*
- *no distortion from heat treating*

**With heat treating eliminated, the problems that accompany heat treating are avoided. Quench cracks become a thing of the past. Distortion and warpage from heat treating don't occur . . consequently time consuming and costly straightening and cleaning operations are not necessary.**

**You eliminate not only the cost of heat treating but also its disadvantages.**

**If you have parts where strength is a requirement . . you can save money and get away from problems by using "FATIGUE-PROOF." Our Sales Engineers will be happy to show you how this can be accomplished and provide samples for test purposes.**

**JUST PUBLISHED!** Ask for your copy of the new 20-page booklet which gives additional information on the remarkable new "FATIGUE-PROOF."

**LA SALLE STEEL CO.**
1416 150th Street
Hammond, Indiana

*Please send me your "FATIGUE-PROOF" Bulletin.*

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Title _____

Company_____

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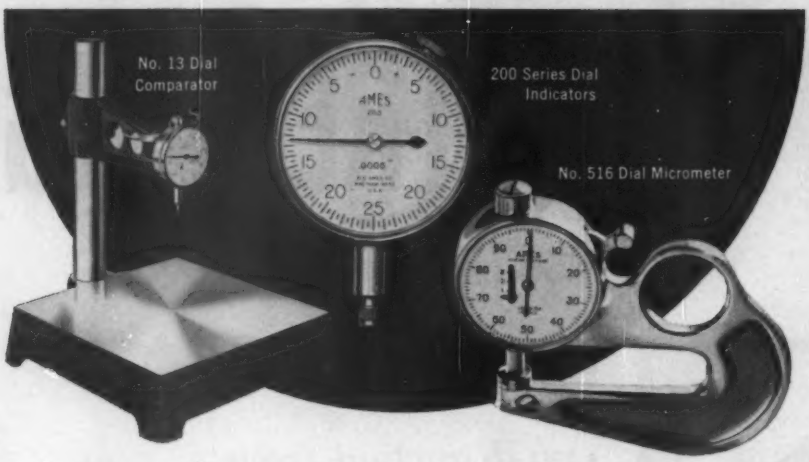
City_____ Zone____ State_____

# AMES

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for time-saving accuracy and dependability

Ames instruments have been making industrial measurement history for more than half a century. Extremely adaptable, they have solved hundreds of tough measuring jobs while providing unquestioned accuracy through many millions of cycles. Ames indicators and gauges enjoy a reputation as the finest you can buy . . . simply because we have *always* employed expert craftsmen and the highest quality materials.

We will gladly make recommendations on your measurement problems. Please send prints and specifications. And ask for your free copy of the Ames catalog.

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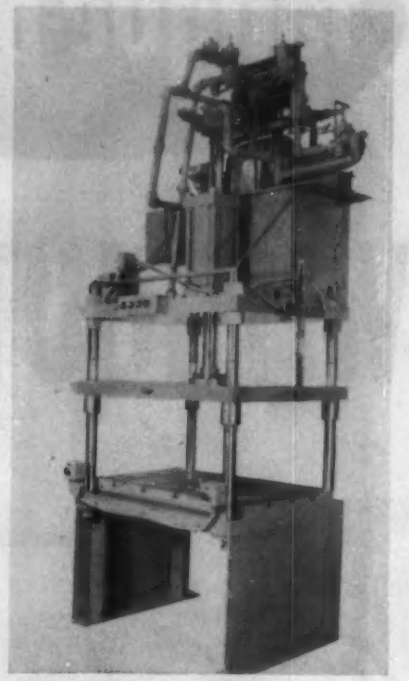
MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS


when wet and should operate at lowest speed consistent with good delivery. Speeds range from 100 to 1750 rpm.

***American Machine Products, Inc, 172 Centre St, New York 13, NY***



## Paul Hydraulic Presses In Variety of Sizes

Hydraulic presses for work such as trimming, compression-type molding, and sheet metal forming are available in a variety of platen sizes and strokes. Sizes range from 25 to 100 tons. Machine uses pressurized stroke which eliminates power lag.

Construction includes steel frame, bronze guide bearings, four alloy-steel columns, three steel platens, inching adjustment incorporated into top platen. T-slotted bolster plate is supplied as standard equipment.

Hydraulic unit is self-contained and of differential-circuit type with high and low pressure pumps. Double-shafted motor has pump coupling attached at each end. Electrical controls are centrally located.

***Paul Machine Tool & Die Works, 4600 S Kedzie Ave, Chicago 32, Ill***

## New Hydraulic Filter For High-Speed Machinery

Purolator's No. 56670 is designed for use on skin-planers, spar profilers, and other large, hydraulically operated machine tools requiring fluid pressures and flow rates necessary for high-speed operation.

Resin-impregnated paper filters

*You are missing a bet!*

# Use U.S. DRILL HEADS with Turret Lathes...

Write Today for Latest Catalog

Multiple Spindle Drill Heads have many uses, yet oftentimes they are not considered as being applicable to automatic turret lathes.

If you want to reduce labor costs and the number of operations required to complete a particular part, why not see how U. S. Drill Head engineers can help you.

Write or wire us today. There's no obligation, of course, and the chances are that we can save you time and money.

**Manufacturers of all types of fixed center and individual lead screw tapping heads.**

US HEADS

Since 1915

## UNITED STATES DRILL HEAD CO.

616-618 Burns Street, Cincinnati 4, Ohio

NEW
WILLIAMS
LOCKING
ADJUSTABLE
WRENCH
THE ONLY REAL ADJUSTABLE WRENCH IMPROVEMENT IN OVER 40 YEARS!
PUSH DOWN TO UNLOCK
AVAILABLE AT NO EXTRA COST
PUSH UP TO LOCK
WITH FEATURES
YOU HAVE ALWAYS WANTED IN AN ADJUSTABLE WRENCH
• No Obstructions
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• One Hand Operation
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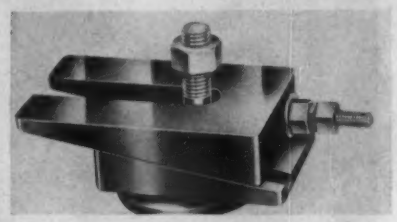
AVAILABLE IN FOUR MOST POPULAR SIZES
No. Size Capacity List Price
6L 6" ¾ $2.06
8L 8" 15/16 $2.45
10L 10" 1⅛ $3.10
12L 12" 1⅜ $4.50
WILLIAMS
INDUSTRIAL TOOLS
"The Broadest Line of Its Kind"
you'll get SERVICE ON THE DOUBLE from your DISTRIBUTOR'S SALESMAN. He'll give you quickest delivery at lowest cost!
J. H. WILLIAMS & CO., 406 Vulcan Street, Buffalo 7, N. Y.


micronic size particles from hydraulic fluids at operating pressures of 1000 psi, handles flow rates of up to 75 gpm. Micronic filter element is easily replaced by removing snap ring holding case cover in place. All-steel case contains an O-ring seal in head, 1½-in. connections at either end.

*Purolator Products, Inc, Rahway, NJ*



## Gy-a-liner Leveling Block Adjusts Machine Alignment

Patented wedge leveling block is designed to adjust all types of machines to precision alignment. Cast iron wedge is bolted to machine leg, and compensates for uneven floors. Device is made in four sizes, for weights to 10,000 lb.

Literature available.

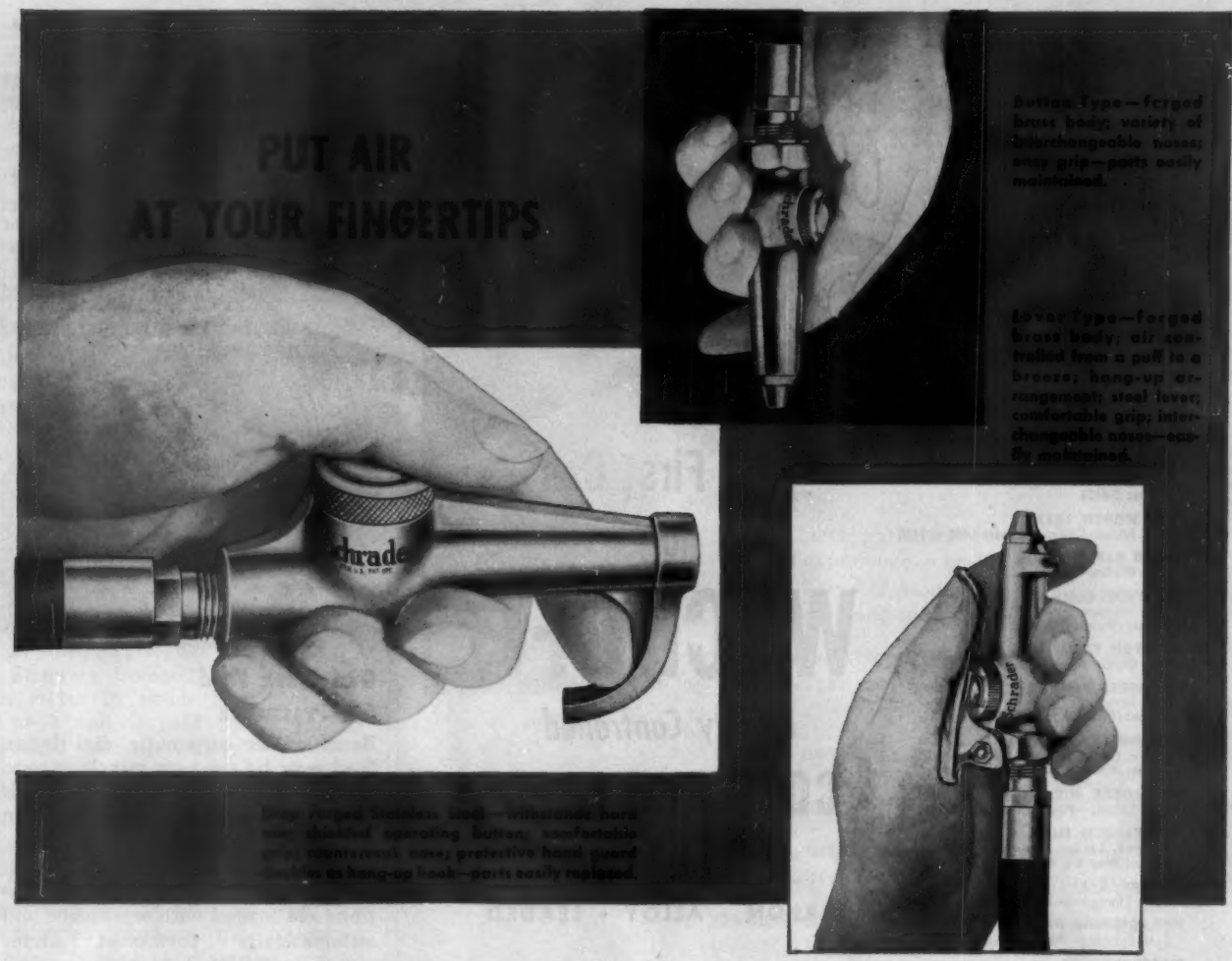
*Gy-a-liner Mfg Co, 38 Fox Hill St, Westwood, Mass*

## Portable Machine Achieves High-Speed Centering

Designated as the St. Mary's Spin Roll, an all-purpose centering tool is said to achieve absolute concentricity for all metal components from 0 to 1.250 finished diameters without use of collets or chucks. Fully automatic, unit is self-adjusting to uniform diameters, lengths, speeds, and feeds because surface speed is constant. Concentricity is achieved through synchronized interlocking rollers driven by a motor. The work rotates on its own diameter between the spin rolls while secondary diameters are generated.

Used as either a machine accessory or as self-combined bench unit, the precision and holding power of Spin Roll is reported adaptable for all rotary machining and grinding operations. It converts a surface grinder into a centerless external grinder which will accommodate centerless OD work and grind radii on pilots and locators. Adapted to an internal grinder it will grind bushings and die buttons. Used on lathes to turn, drill, bore, or chamfer, the Spin Roll is said to give jig-bore accuracy for concentric work.

Over-all dimensions of the Spin Roll are 8¾ x 9⅝ x 17 in. including


PUT AIR
AT YOUR FINGERTIPS
Button Type—forged brass body; variety of interchangeable noses; easy grip—parts easily maintained.
Lever Type—forged brass body; air controlled from a puff to a breeze; hang-up arrangement; steel lever; comfortable grip; interchangeable noses—easily maintained.

# Use Schrader blow guns . . . 36 designs and styles

Schrader Blow Guns are made to *fit your hand . . . fit your job!* Schrader Blow Guns are built to take it—here's why:

They're rugged both in design and construction. Bodies are drop-forged either of brass or stainless steel.

They're convenient—can be used anywhere. Blow gun circuits—using Schrader Couplers, Hose and Automatic Hose Reels—take little space, yet put compressed air right at your fingertips.

They're economical—they have few moving parts. And replacement parts, when and if needed, are easily installed.

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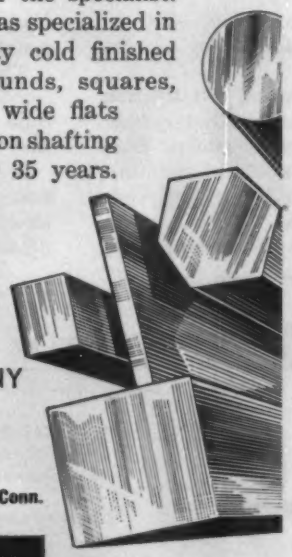

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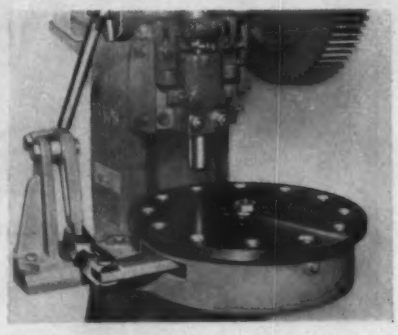
the 1/6-hp, 110-v single-phase capacitor motor. Pressure roll is manual or automatic and accessories available include: air gage, pressure reducing, valve station, and quick coupler. Compressed air requirement is 20-lb minimum line pressure. Entire unit weights 65 lb.

*Pivot Punch & Die Corp, 373 Old Niagara Falls Blvd, North Tonawanda, NY*



## Dial Index Feed For Presswork

Benchmaster automatic dial index feed may be used on punch presses as well as drillpresses. Accessory is said to operate at rates up to 6000 strokes per hr.

Rotating table is actuated with each ram stroke or quill travel. Stations are loaded with workpiece and automatically positioned under punch or drill for machining operation. Available models have 12 or 15-in. table diameter with choice of 10 or 12 stations. Larger tables with up to 24 stations can be supplied.

Other specifications: over-all height, 3¼ in.; depth, 13 in.; width, 21 in.; net weight, 95 lb.

*Benchmaster Mfg Co, 1835 W Rosecrans Ave, Gardena, Calif*

## Polymer Nylon Tubular Bars Are Concentrically Bored

Centrifugally cast bars are said to be the first large-diameter, heavy-walled nylon tubing available in precision sizes, permitting fabrication of large parts at considerably less cost than that involved in machining from solid bars. Stock costs less per foot than solid pieces, and drilling operations are reportedly eliminated entirely.

Size range is similar to that generally available in brass and bronze, permitting use of standard metalworking techniques on standard metalworking equipment in making wide variety of finished parts.

After being cast to approximate

size, tubular bars are annealed and machined to close dimensional tolerances. Outside diameters range from 2 through 10 in. with wall thicknesses of ⅜ through 1 in. Standard lengths are 8 and 13 in., although as originally cast they run 24 and 26 in. long.

*Polymer Corp of Pa, Reading, Pa*

### Texaco Drawing Compound 2 Resists Caking and Hardening

Drawing Compound 2 combines mineral oil, a non-abrasive pigment, and an exclusion dispersion agent which is said to retard pigment settling out. The result is a compound which, it is claimed, can be left on dies for long periods without danger of hardening or caking, so that dies can be stored directly after a production run, without cleaning off the drawing compound. Rust protection is also claimed for the material when left on dies during storage.

Drawing Compound 2 is miscible in water in ratios from 1-to-1 to 1-to-10 and is said to be readily washed off with water.

*The Texas Co, 135 E 42nd St, New York 17, NY*

### Stainless Steel Clamps

Line of stainless steel clamps for precision tooling developed by Von Industries includes the following types: type A, sliding—wide face; type B, round nose—rear tightening; type C, sliding—round nose; type D, rear tightening—taper nose. All are available in wide range of sizes.

Swivel stud, hex swivel nut, and knurled swivel nut made by company are all interchangeable with the above clamps.

Clamps for machined surfaces are also supplied in a variety of types and sizes.

*Von Industries, Inc, Williston Park, NY*

### Westberg Colletmandrel In Improved Design

Now manufactured by Erickson, Westberg Colletmandrel is supplied so that it can be machined in place on the customer's equipment. According to manufacturer, device is only known commercial expanding mandrel that will grip in a hole as small as 3/16 in.

Colletmandrel is a one-piece mandrel which operates as a reversed collet; construction grips and releases workpiece on inside surface in same manner that a collet grips on outside surface. Device incorporates three "fingers" twisted half a turn

THE MORE KNOW-HOW YOU PUT IN THE BARREL, THE MORE PROFIT YOU TAKE OUT

Useful facts gathered during Oakite's years of experience in barrel finishing are packed like #12 stones in this 10-page booklet covering such subjects as:

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**BURNISHING**—Good solutions; Burnishing media, water and work ratios, etc.; How to overcome water hardness; How to keep barrels and media clean; How to prevent rusting, tarnishing and other corrosion.

**FREE** For your copy of "*May I put my head in your finishing barrel?*" just write or mail the coupon.

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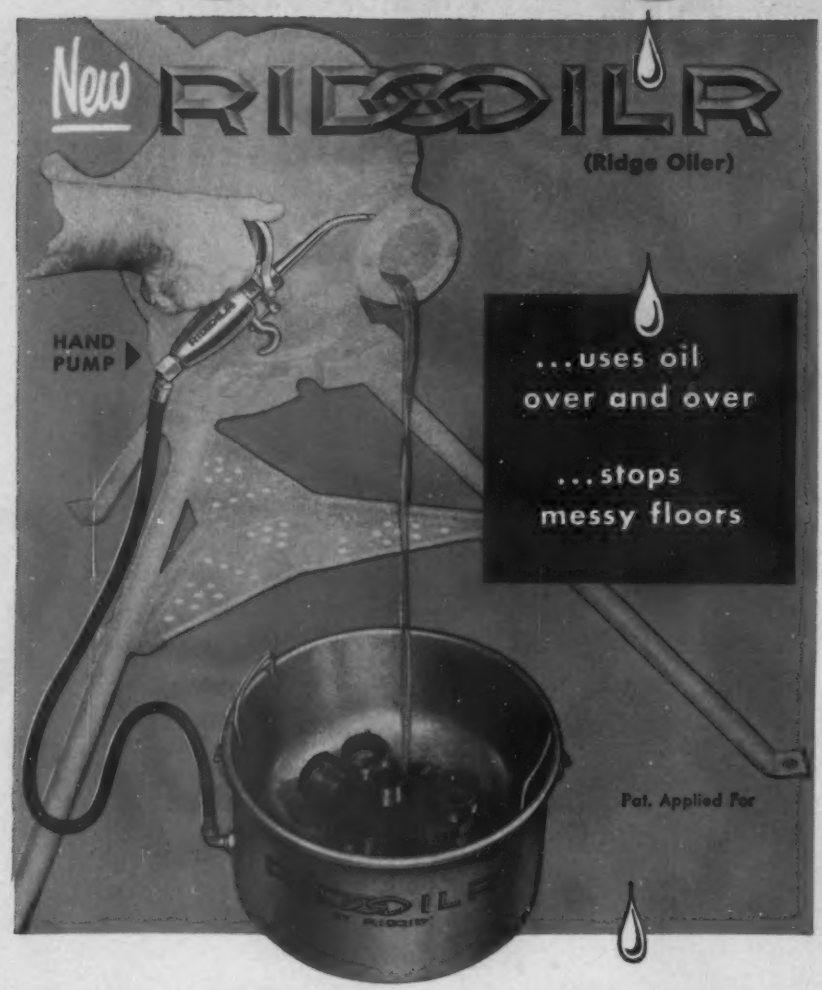



New **RIDG-OILR** provides chip-pan, circulating oil reservoir and hose-connected hand pump-gun, easily carried to any threading job, hand or power. You see the advantages at once—dies can be flooded cool, cut better threads, last longer; oil is double strained and re-used, no waste; no messy floors. Quickly pays back its small cost in oil savings alone! See it . . . buy it at your Supply House. Immediate delivery!

RIDGID Work-Saver Pipe Tools

**The Ridge Tool Company • Elyria, Ohio, U.S.A.**


between taper and mandrel portion, causing a reversal of the gripping direction.

*Erickson Tool Co, East 23rd & Hamilton Ave, Cleveland 14, Ohio*

## Speed Drive Offers 100 to 1 Range

Reliance VS-100 Drive, a wide-range, adjustable-speed drive for machine tool feeds, affords a speed range of 100:1, with reported high degree of stability over the speed range. Capacity of the drive is from ½ to 4 hp.

Drive is a packaged unit with electronic control panels suitable for mounting and integrating with other machine controls. All small electronic components are grouped, wired, and sealed in plastic for protection.

*Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio*

**Numbers and letters,** individual, self-sticking, temperature-resistant, are available in six sizes from ½ to 5 in. high, mounted on dispenser cards.

*W H Brady Co, 727 W Glendale Ave, Milwaukee 12, Wis*

**Oil-hydraulic pipeless power package,** Series T-8, consists basically of an electric drive motor, pump, and control circuit. Designed for light-duty industrial applications such as clamping, indexing, and transfer operations; available with variety components for range of performance characteristics.

*Vickers Inc, 1400 Oakman Blvd, Detroit 32, Mich*

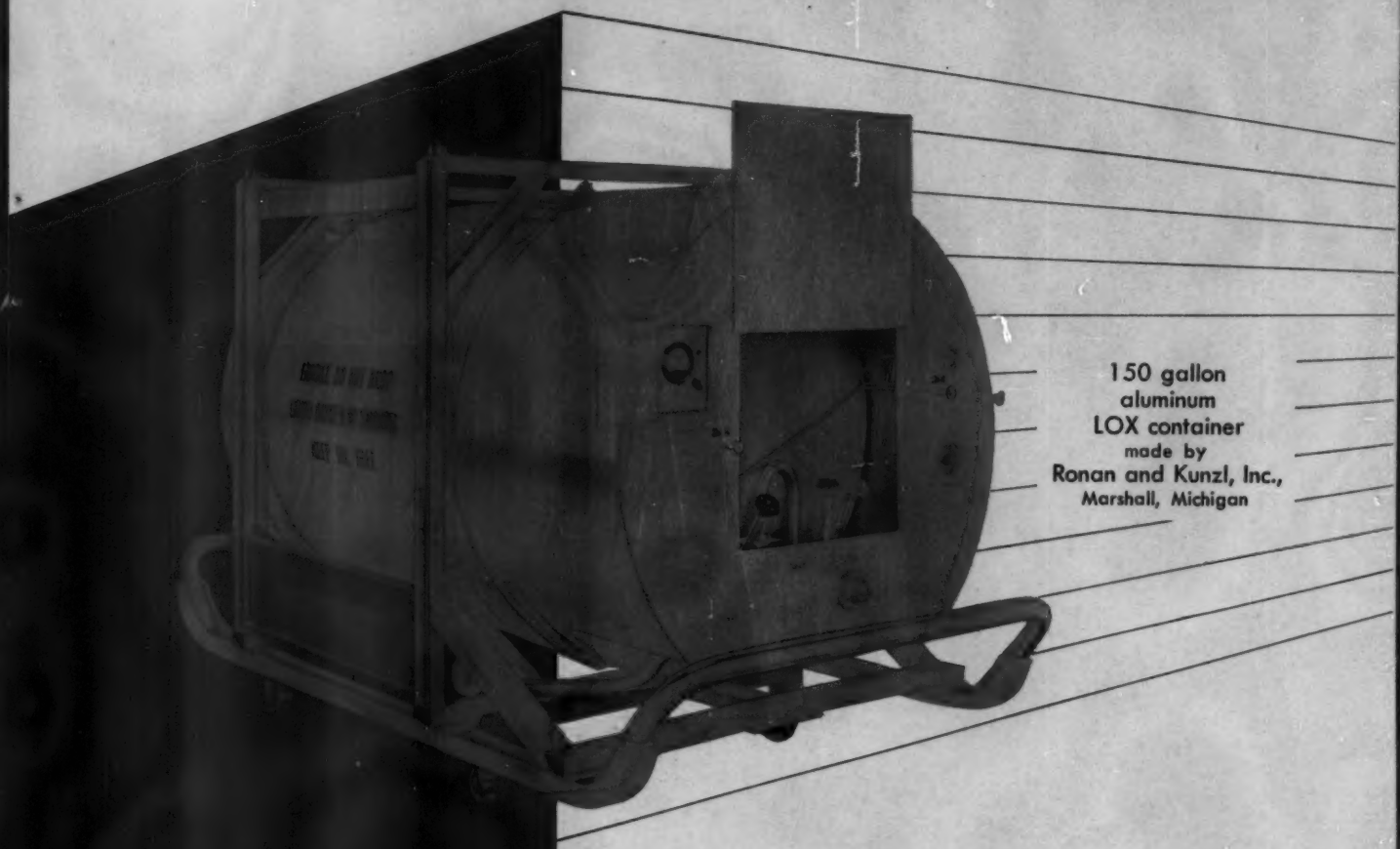
**Opti-Li-Magnifier** provides 4x to 7x magnification, with flashlight attached in position to illuminate object being viewed. Price, $9.50. Clips to pocket, and has over-all size of 6½ in., weight, 8 oz.

*Earl Elwyn Smith Associates, 7 S Main St, West Hartford 7, Conn*

## Constant-Voltage Welders For Automatic Welding Operations

Welders are available in capacities of 500, 750, and 1200 amps, allowing operator to select desired voltage, set correct feed and travel rate, to get desired deposit.

According to the manufacturer, starting and recovery are instantaneous, and hunting is eliminated. Said to be able to double the welding capacity on some field-welding jobs powered by engine-driven generators. Job-tested on such work as



150 gallon
aluminum
LOX container
made by
Ronan and Kunzl, Inc.,
Marshall, Michigan

# *50 Micron Vacuum Plus 50 psi Pressure Test Strength of Welded Aluminum in Liquid Oxygen Tank*

**To retain oxygen** in its liquid state Ronan and Kunzl LOX tanks are designed like large vacuum bottles using the Dewar principle. A double-walled aluminum container is heliarc-welded to successfully sustain a vacuum below 50 microns plus inner tank pressures up to 50 psi. Internal pressure is the result of a method used to discharge the liquid oxygen. The 150 gallon LOX container, illustrated, as well as 50 and 500 gallon models are designed to Air Force specifications and made of Reynolds Aluminum.

**The weldability of aluminum** was just one factor in its selection for the liquid oxygen containers. Aluminum was also selected because it is lightweight and because it remains ductile at −300 F. Only a metal with aluminum's ductility could withstand the thermal shock to which these containers are exposed. And only aluminum met the rigid strength per pound requirements of the Air Force.

**In addition to tank elements,** the framework and skids of LOX containers are also made of aluminum. Alloy selection for the various parts was based on recommendations of Reynolds Engineering Service.

Here, as in so many other high performance applications, light, strong rustfree aluminum does the job better. See the next page for information on how you can design and fabricate aluminum more efficiently and profitably.

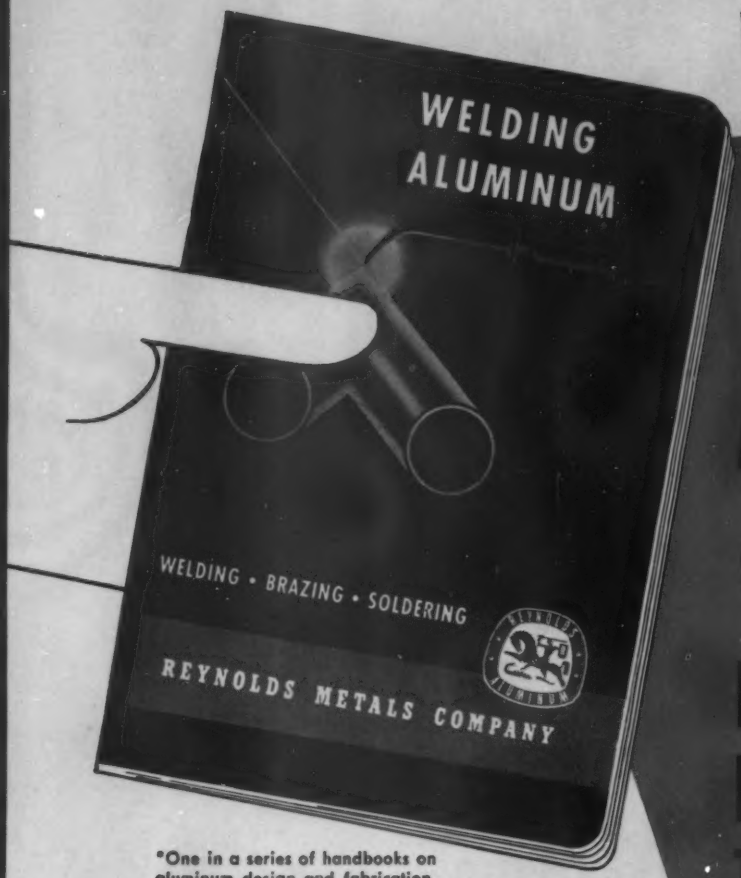
This seal is a symbol of quality aluminum to millions. Find out how it can add sales appeal to your products.

Designed in REYNOLDS ALUMINUM

*See Reynolds New Program "Frontier"—Sundays on NBC-TV.*

**REYNOLDS ALUMINUM**

MODERN DESIGN HAS ALUMINUM IN MIND

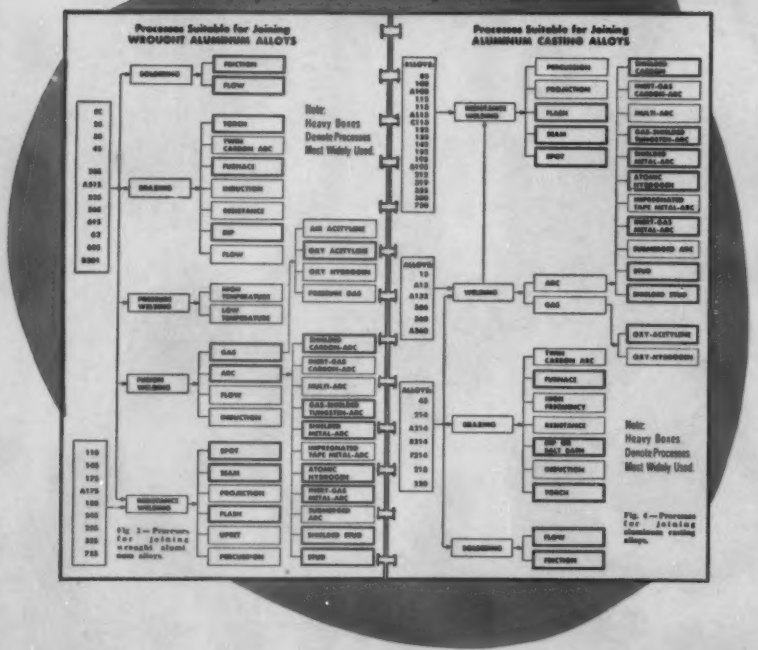



*One in a series of handbooks on aluminum design and fabrication.

# WELDING
cuts costs—reduces weight
# ALUMINUM
cuts costs—reduces weight

## 186 PAGE REYNOLDS HANDBOOK*
## Tells You How

These are typical pages showing treatment of subject matter in this comprehensive handbook.


Processes Suitable for Joining WROUGHT ALUMINUM ALLOYS
Processes Suitable for Joining ALUMINUM CASTING ALLOYS
Note: Heavy Boxes Denote Processes Most Widely Used.
Note: Heavy Boxes Denote Processes Most Widely Used.

Anyone familiar with welding other metals will find all he needs to know about welding aluminum in this new 186-page handbook.

This is a new edition with information on 34 processes for welding, brazing and soldering aluminum and its alloys. It thoroughly discusses the various methods and techniques and recommends the processes best suited to each design requirement.

For assistance with your problems in aluminum fabrication you can request the direct consultation of men from Reynolds Engineering Service. They will gladly work with your own designers, engineers and production men on your particular aluminum applications. For your free copy of "Welding Aluminum" and a complete index of Reynolds technical literature, write on business letterhead to *Reynolds Metals Company, P.O. Box 1800-JJ, Louisville 1, Kentucky.*

*See Reynolds New Program "Frontier"—Sundays on NBC-TV*

**REYNOLDS ALUMINUM**

MODERN DESIGN HAS ALUMINUM IN MIND

submerged-arc, inert-gas, semi-automatic, hard-surfacing, automatic-stud and low-current-density welding.

*The Harnischfeger Corp, Milwaukee 46, Wis*

**Bandsaw blade,** designated Hook Tooth, has teeth incorporating a positive rake angle and smooth blending of radii in tooth gullet to permit greater chip removal without increasing frictional heat. Available in standard sizes, 2 to 6 teeth per in., ¼ to 1-in. width.

*W O Barnes Co, 1297 Terminal Ave, Detroit 14, Mich*

**Parallel bars,** called Honi-Kom, to hold small, flat, or irregularly shaped pieces for grinding or machining, may be used in any horizontal position on any magnetic chuck. Available in matched pairs; size ¾ x 2 x 4 in.

*Auburn Machine Co, 307 Chapman St, Providence, RI*

**HSS countersink** is of one-piece solid-bar construction, will fit hand and power drills with ¼-in. chucks or larger. Has 5-flute head machined at 82° angle to seat wood and machine screws.

*The Stanley Works, New Britain, Conn*

**Hard-facing electrode,** Mir-O-Col No. 11, for use where high corrosion and high abrasion at elevated temperatures exist, reportedly retains characteristics at red heat, produces smooth, bright, non-oxidized deposit free from porosity. Recommended where only moderate impact is encountered, due to high hardness. Applied by either acetylene or electric ac-dc.

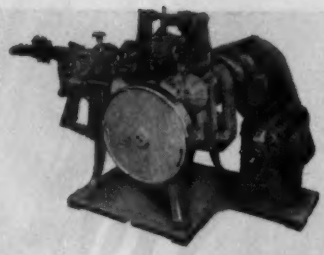
*Mir-O-Col Alloy Co, 312 N Avenue 21, Los Angeles 31, Calif*

**High-carbon electrodes** for manual application deposit a carbon ratio of 0.60 to 0.70; available coated or uncoated for build-up work. Automatic wire electrodes can be applied with either submerged or open arc; can be used for semi-automatic or automatic squirt welding.

*Pacific Welding Alloy Mfg Co, 310 N Avenue 21, Los Angeles 31, Calif*

**Microscope,** designated Micro-Viewscope, incorporates built-in illuminating system and projection elements for the 8-in. viewing screen. Range of magnifications is from 75 to 1000X.

*William J Hacker & Co, 82 Beaver St, New York 5, NY*

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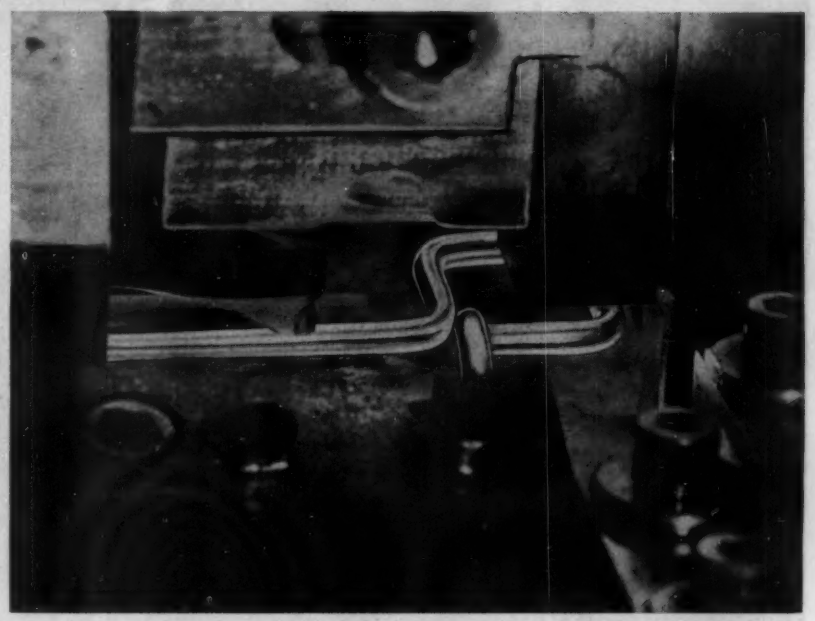

Forming Operation: Meter Shunts of 3/16" Wire Stock

WHY NILSON IS TOPS FOR 4-SLIDES:
Nilson 4-Slides are built for rugged duty
Form both ribbon metal and wire stock
Press capacities 8 to 75 tons, wire diameter to ½"
*16 Models Available, Including Combinations of Horizontal Press and 4-Slide*

YOU PROFIT BY: Automatic Operation • Increased Production • No Secondary Handling • Improved Products • Fewer Rejects • Lowest Initial Cost

Nilson engineers are always available for consultation on forming problems. Bulletin #61 sent on request.

Nilson's 3 tilt and 3 stationary reels handle wire or ribbon stock coils up to 500 pounds.

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Chicago-Latrobe service means two things to you: 1. Dependable, on-time delivery from the most complete line of cutting tools, and, 2. Skilled help on tough problems from your Distributor and Chicago-Latrobe's own Service Engineers.
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# ROUND TABLE Discussion

## DEAR EMPLOYEE . . .

*Is a company letter, sent to each employee, a satisfactory way to inform the worker of contemplated changes in policy, job shifts of major importance, plant relocation? Is such information better given out by each foreman?*

IF A COMPANY LETTER is the only means used to tell the working forces about major changes coming up it is not a discreet method. The company letter, personally addressed to each "Dear Employee," neatly typed, expertly written, on good quality paper, emblazoned with an official letterhead, flaunting a spirited motto, signed with a distinguished title by a high ranking member of management with whom few, if any of the working force, are on speaking terms, has its place in worker-management relations.

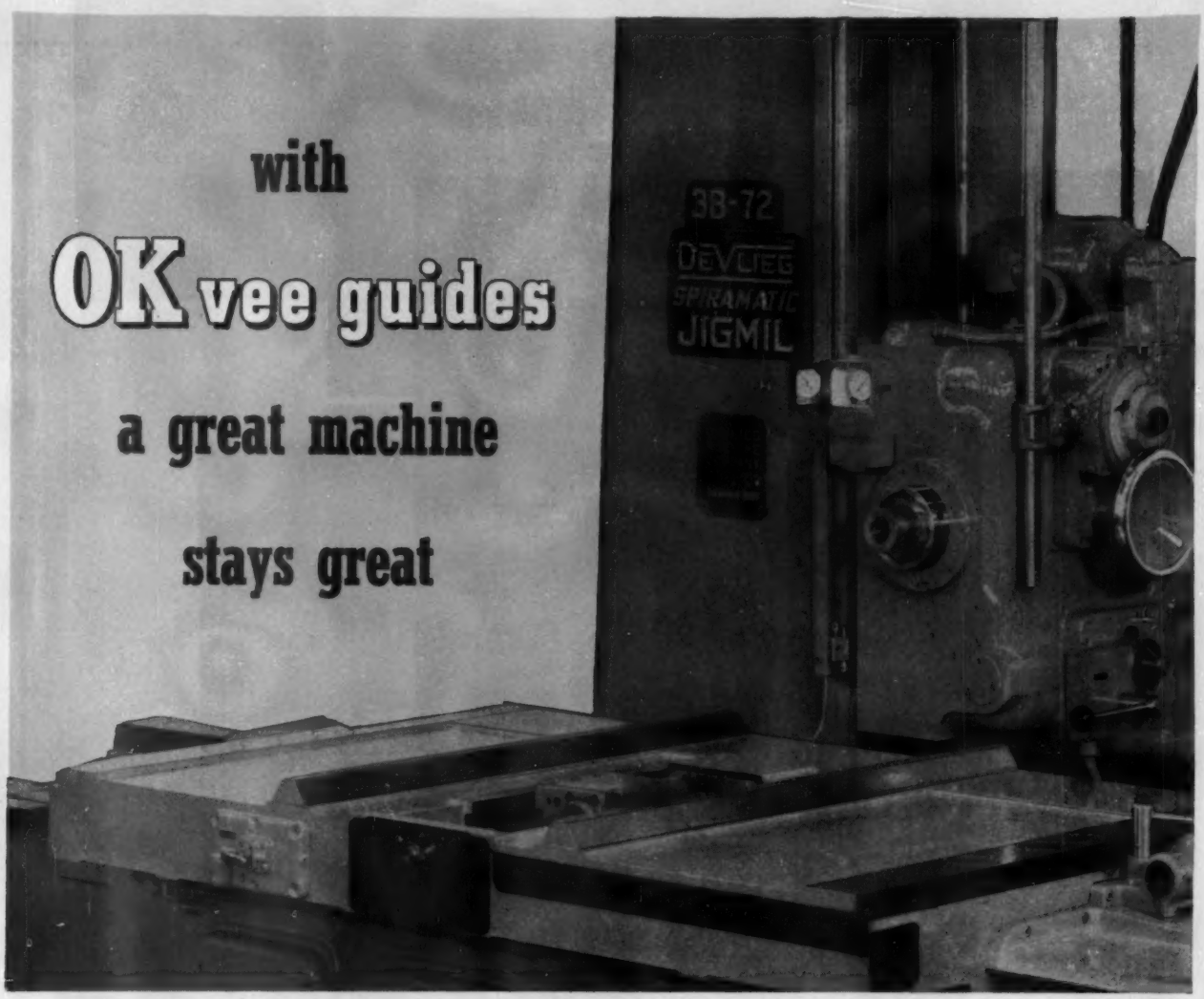
The company letter can be a good means of accomplishing a good end. Like any method, to be efficient it must be used properly at the right time, in the right place, and under favorable circumstances.

When management has something to say it must be effectively presented. In management-worker communications, to be effective, to get there solidly, say it through that member of management the worker knows best, the shop foreman.

Information concerning major changes in working conditions of employees should first be given out through the foreman. This consti-

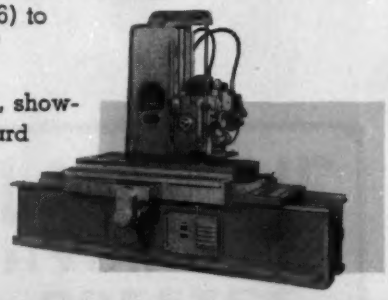
*(Continued on page 263)*

# with OK vee guides a great machine stays great

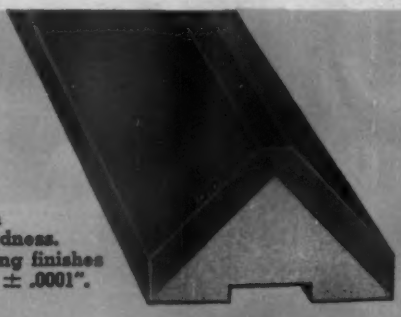



THE DeVLIEG MACHINE CO. has been a consistent user of OK Hardened Products for many years. They build absolute precision into their line of boring and milling machines. One of the methods of achieving this ultra-precision throughout the life of their machines is with OK hardened vee guides as illustrated in this exposed photo of their Spiramatic Jigmil.

**Here's why OK hardened vee guides contribute to machine tool accuracy:** They are virtually wear-proof, a result of welding special analysis tool steel to a mild steel backing. High wear-resistant properties are produced by special hardening (Rockwell C-65-66) to a depth of 3/16"



**For Free bulletin, showing seven standard cross sections in over 60 sizes, write Dept. 45-W**



**Cross section illustrates depth and area of hardness. Precision grinding finishes to tolerances of ± .0001".**

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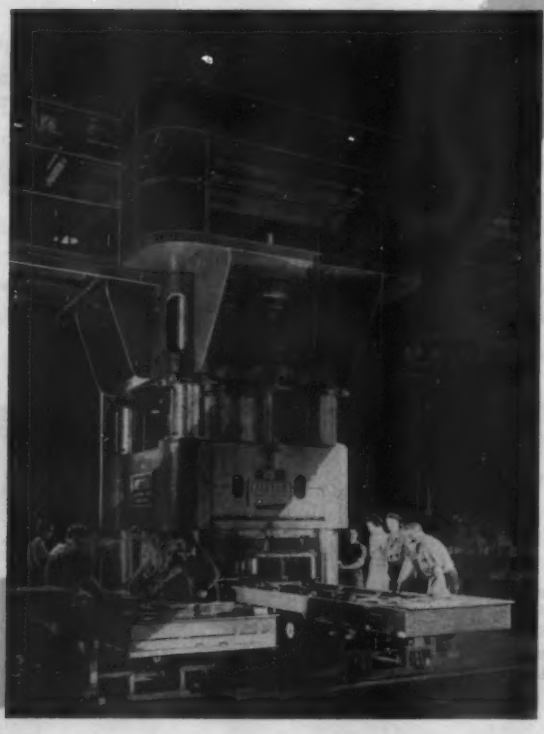
CINCINNATI 23, OHIO

## FROM BATHTUBS

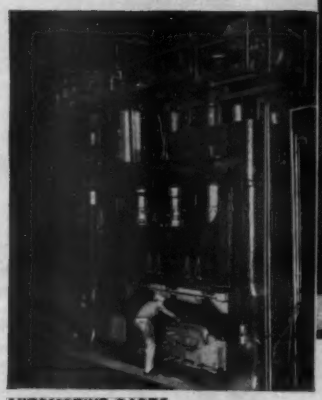
## TO AIRCRAFT PARTS...



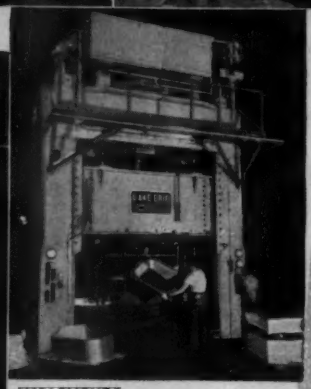
APPLIANCES

ORDNANCE

FARM MACHINERY



AUTOMOTIVE PARTS



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"Everything" is a broad term...but suppose you be the judge as to whether your production could be *hydraulically-pressed* to advantage. Pressing metal into a desired shape reduces or completely eliminates costly machining and scrap. For help in reaching a decision regarding this newer method of production, use our competent engineering assistance freely.

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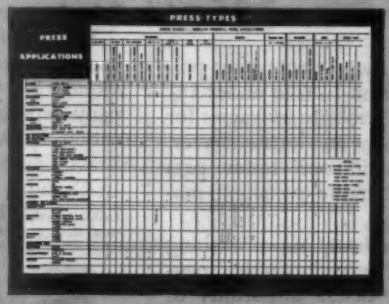


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# CUT POLISHING COSTS IN HALF WITH Formbrite

## the new superfine-grain drawing brass with the built-in finish

**The secret is in the grain:** Special methods of rolling and annealing produce in Formbrite* a grain structure so fine that often a simple color buff will bring it to a bright, lustrous finish.

Formbrite is also harder, stiffer, springier and more scratch resistant—yet it is surprisingly ductile, readily stamped, formed, drawn, and embossed. And Formbrite plates beautifully.

More and more companies are using Formbrite to cut their polishing costs and get superior products—at no extra cost over ordinary drawing brass. They often save more than the cost of the metal itself.

**Globe Lighting Products:** Reports savings in polishing cost of from 26% to 55% in various components of their high-quality, solid brass lighting fixtures. Work pile-ups were eliminated in the polishing room, too.

**Farrington Mfg. Co.:** Rejects after polishing dropped from 11% to under 1% after switch to Formbrite in frames for "jewel-box" case for an electric shaver. A better finish in one faster pass through the automatic polishing machine.

**Jarco Metal Products, Inc.:** Polishing costs cut 40% in deep-drawn pen, pencil, and lipstick cases. Uniformity of Formbrite eliminated shutdowns for adjustments in long-run production.

**Spill-Stop Mfg. Co.:** Saved enough in polishing cost to avoid price increases—despite increased labor and material costs. Reports Formbrite fabricates almost as readily as the softest drawing brass . . . uniformity of gage in Formbrite has simplified manufacture.

Find out for yourself how Formbrite can serve you as a short cut—save you money. See your American Brass Company representative. Write for Publication B-39. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 8187

*Reg. U. S. Pat. Off.

Formbrite

FINE-GRAIN DRAWING BRASS

an ANACONDA® product

made by

The American Brass Company

tutes face-to-face communication for which there is no substitute of equal effectiveness. Misunderstanding, doubt, and confusion are immediately removable.

The foreman is more than that member of management best known to the worker. He is that member of management who knows the worker best. He is often well acquainted with the worker's family, friends, and associates. He knows the worker's fraternal, social, religious, and political connections.

The "Dear Employee" company letter is a means of correcting a condition—poor communications in the shop. The cause is a failure on the part of the foreman to pass along information vital to employee morale.

Top management wants the foreman to be informed on company policies, plans and progress, on current economic trends, on community activities, on labor-management trends, and on current political philosophy. Sometimes top management is lax about keeping the foreman informed. More often than not the foreman is too lazy to absorb the information placed at his disposal. A company letter could be used to correct this inefficiency. It is nevertheless a reflection on the foreman's prestige.

The worker may not even read the "Dear Employee" letter when he gets it from the postman. He'll glance at it and say, "I've heard this stuff before." However, he will leave the letter lying around the house so his wife and children will be sure to see it.

The worker wants the family to know that he is considered important enough to get an informative letter from the big shots. The family reads

*"The fellow who wrote that slogan isn't married to my Hattie!"*

**PRODUCTION UP 53%**

**FEWER REJECTS**

**HOWE & FANT TURRET DRILL CASE HISTORY**

**#25**

Part — Aluminum elbow

Fixture — 3 position, lever transfer, air clamp, bolted to machine table.

**Operations**

**I** Load. **II** Spot 2 holes 3/8 x 90°. **III** Index turret and drill 2 holes .272" dia. .625" deep. **IV** Index turret and tap 2 holes 5/16—24 class 3 fit .520" deep. **V** Index turret and core drill 1 hole .801" dia. .410" deep. **VI** Unload and clean.

Production rate — 73.2 pieces (512.4 machining operations per hour).

**Comment**

Job is a "natural" for the H&F turret drill. Part is clamped by air in simple fixture lever actuated to provide 3 predetermined working positions. This assures minimum transfer time and proper location of part under working tool. Each tool turns at optimum preset speed in this case:

| | |
|---|---|
| Spot drill | 1825 r.p.m. |
| .272" dia. drill | 2375 r.p.m. |
| 5/16—24 tap | 1150 r.p.m. |
| .801" dia. core drill | 825 r.p.m. |

Tap automatically reverses at twice forward speed at preset depth. All depths controlled within .002".

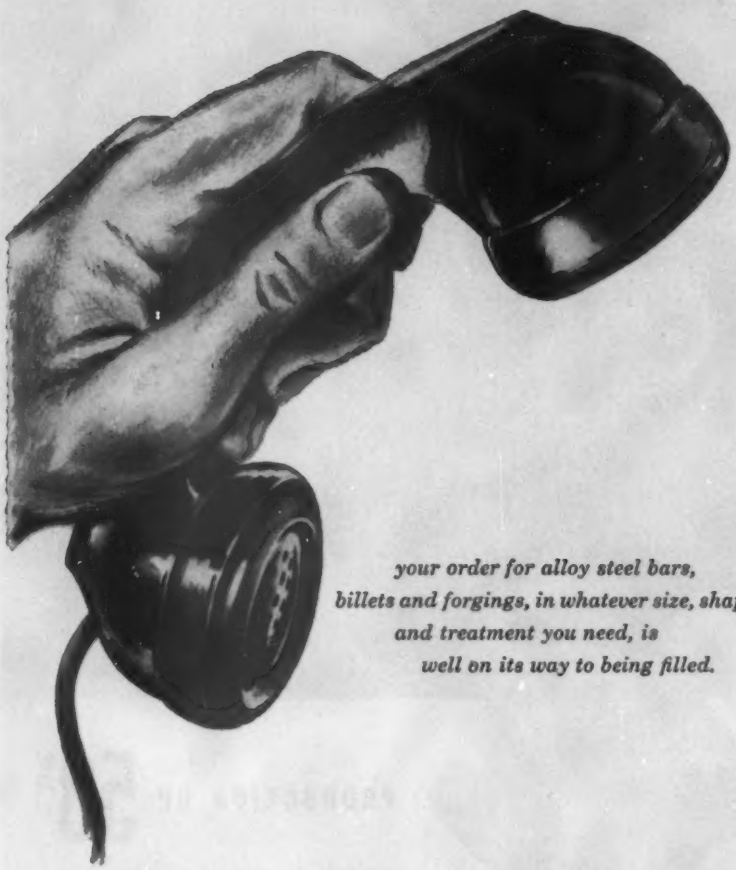
Set-up increases production 53% over 4-spindle drill press with box jig. Rejects are virtually eliminated, tool life greatly increased. The H&F installation has won unanimous operator approval by appreciably cutting fatigue while increasing output.

WRITE FOR THE H&F CATALOG AND FURTHER TIME STUDIES

hf HOWE & FANT, Inc.

27 FITCH STREET • EAST NORWALK • CONNECTICUT

*Before you hang up,*



*your order for alloy steel bars, billets and forgings, in whatever size, shape and treatment you need, is well on its way to being filled.*

All seven of our modern warehouses are located in principal industrial areas... near you. Each one is well-stocked: equipped to fill your alloy steel requirements promptly, whether you need standard AISI, SAE or our own special HY-TEN steels—"the standard steels of tomorrow". Every warehouse, too, is staffed with experts in metallurgy who are ready to serve you.

Write today for your FREE copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

*near you . . .*

*Warehouse Service* – Cambridge • Cleveland • Chicago
Hillside, N. J. • Detroit • Buffalo • Cincinnati
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**WHEELOCK, LOVEJOY & COMPANY, INC.**

**137 Sidney Street, Cambridge 39, Massachusetts**


the letter. Management's viewpoint becomes a topic of conversation. Family, friends, neighbors, the whole community knows what is going on and the reason for it.

The worker is questioned. He knows the answers because the foreman has already told him the facts and answered whatever doubts he may have had about them. The worker feels proud when he can answer questions accurately as to what is going on at the plant.

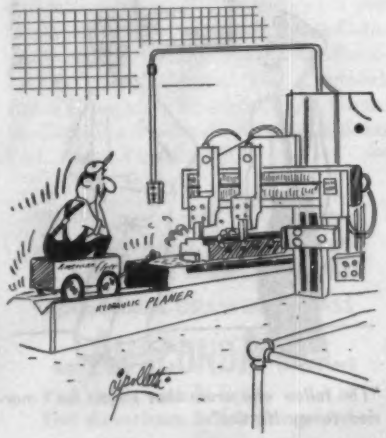
People are curious. They want to know what is going on, especially when it may have an effect on their future security. Man fears the unknown. Fear wrecks morale without which a worker cannot be an efficient competitor.

Keep employees informed about the progress of your company. Do it through the shop foreman. You can't beat face-to-face communication. Use the company "Dear Employee" letter to keep an employee's family, his friends and the community informed.

Peter A Seward
*Swampscott, Mass*

THE MAILING of mimeographed circular letters to employees' homes generally does not create confidence or good will in the mind of the recipients. The letter gets classified among the printed, medium-pressure, advertisements so frequently received. Ed certainly is on the right track in objecting to the scheme.

If some unusually important changes in management, operations, or location affecting all, or nearly all employees has been decided upon and is to be put in effect, then a friendly, simple explanation of the management's decision could be put in the form of a letter, printed in



good typewriter style type, and each letter personally addressed to an individual employee using a similar type typewriter and same color and density ribbon. A letter received in this style will be carefully read, in spite of the fact that many of the employees will realize it is actually a circular letter. It would have to be a very important development in the firm, however, to warrant all this trouble.

Probably the best method to notify all employees about impending changes, of which they should be informed, is to put a special notice on the bulletin board, or boards, in the plant. The news will be quickly and safely spread throughout the establishment and, in addition, all foremen should be briefed so they can give authentic answers to proper questions on the subject, which will be asked no matter how carefully the special notice sheet has been prepared.

To brief the foremen, a competent person should be delegated to visit all foremen the day before the notice is to be released and the pending matter carefully discussed with each one individually. The old, and quite stupid, scheme of calling all the foremen into the conference room five minutes after quitting time to notify them of the impending major changes should be avoided. This supposedly inexpensive method of getting things across to the foremen and their gangs is about the most morale-destroying act that has so far been devised. It should never be used except in the event that the plant is about to close down and go out of business.

George P Pearce
*Albuquerque, NM*

A VARIETY of methods have been developed for communicating information. It can be transmitted in a static form, such as a letter, and received through the sense of sight. It can be put into a dynamic form, such as sound waves, and received through the sense of hearing. This dynamic or vocal form is by far the more personalized method, for the information is transferred directly from one person to another, from brain to sound waves, and to the receiver's brain via his ear.

It is impossible to write a letter which is as personal as a conversation. If the company has an important report to present to the men, the best procedure is to have each foreman inform the men individually or as a group. A letter is


*select most practical*

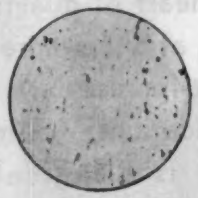
**coolant cleaning**

Composite swarf from wet O. D. grinder — magnified 60 diameters.

USE **BARNESDRIL** LABORATORY RESEARCH

Composite steel swarf from super-finish grinder — magnified 60 diameters.

To help you get production efficiency in the use of coolants, BarnesdriL maintains complete laboratory facilities for testing samples of contaminated coolants and other industrial fluids. From these tests, the characteristics and quantity of contaminants can easily be determined, and studied for recommendation as to the best possible method for efficient removal.



Composite honing swarf — magnified 60 diameters.

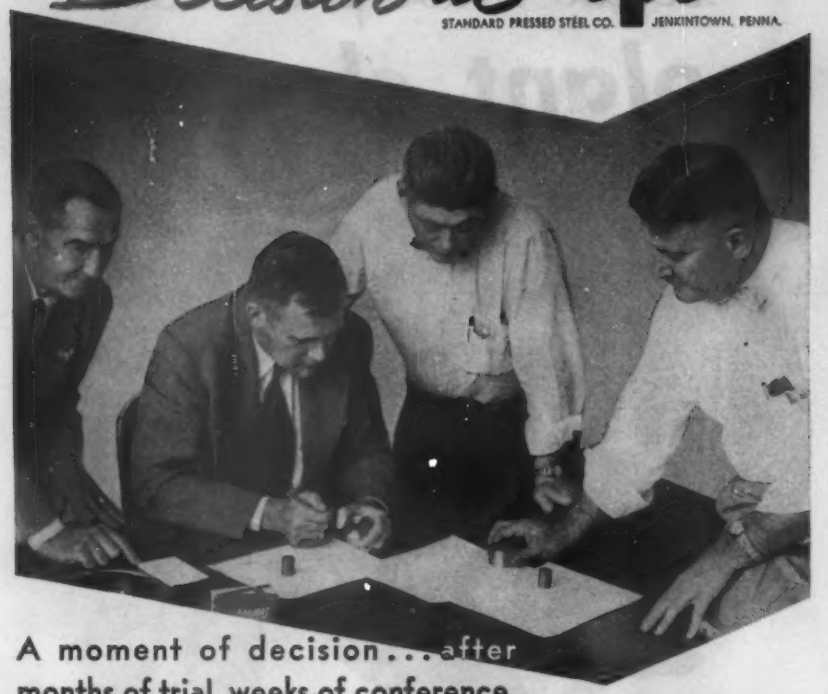
*When you have coolant purification problems send them to BarnesdriL Engineers.*

COOLANT BARNESDRIL CLEANING

**FILTRATION DIVISION**
**BARNES DRILL CO.**
830 CHESTNUT STREET • ROCKFORD, ILLINOIS

Decision at SPS

STANDARD PRESSED STEEL CO. JENKINTOWN, PENNA.



A moment of decision . . . after months of trial, weeks of conference.

It's ADAMAS again

It's ADAMAS . . . again . . . and it's no surprise that Adamas tungsten carbide is specified at SPS . . . for Adamas tungsten carbide products are subject to the world's most rigid set of quality control procedures. Careful selection of materials lies at the heart of quality control at SPS. And, at SPS, where carbide is called upon for use in a great variety of applications, Adamas tungsten carbide is a logical choice . . . for there's an Adamas carbide grade for every job.

Standard Pressed Steel Company of Jenkintown, Pennsylvania is the world's largest manufacturer of Socket Screw Products, Cap Screws, Set Screws and a variety of other threaded fasteners. These SPS products are used on aircraft, home appliances, business machines, in fact, wherever products or components must be held together. A continuing program of reseach and development at SPS assures a lasting place for the Company in America's future.

ADAMAS CARBIDE CORPORATION

KENILWORTH • NEW JERSEY

tungsten carbide tools • tool tips • dies • wear parts


capable of presenting information in a concise, formal manner but no matter how carefully composed it cannot compare with a personal presentation which can be adjusted to suit the time, the place, and the mood.

An announcement will affect different people in different ways because of personal differences, and different levels and positions in the organization. The foreman can make some adjustments in his method of presentation to compensate for these differences for he is the individual who is closest to the men and knows them best. The advantages of a personal presentation are apparent at a lecture. In most cases the audience could get this information from printed works on the subject, yet they make the necessary effort to be present because of the advantages of the personal presentation.

The printed word is firm and determined. It stays the same no matter how often we reread it. Semantics is an inexact science and the written word cannot convey the exact shade of meaning. A personal presentation permits each point to be repeated in the same or different manner until the speaker is sure his exact meaning is understood.

In addition, there is an added advantage which is probably the most important one. A letter cannot answer the reader's questions. No matter how carefully it may have been composed and checked, and no matter how complete the text there are always those special situations and border-line cases. When the announcement is made by the foreman in an informal manner to a small group he can always stop to answer questions as he goes along.

For presenting important information to the men the best pro-

*"Just 'til he paints under you, Mr. Hoskins!"*

*A Completely New Machine—*

designed especially for

**BORING AND MILLING SMALL PIECES**

**for PRODUCTION WORK or ONE-PIECE JOBS**

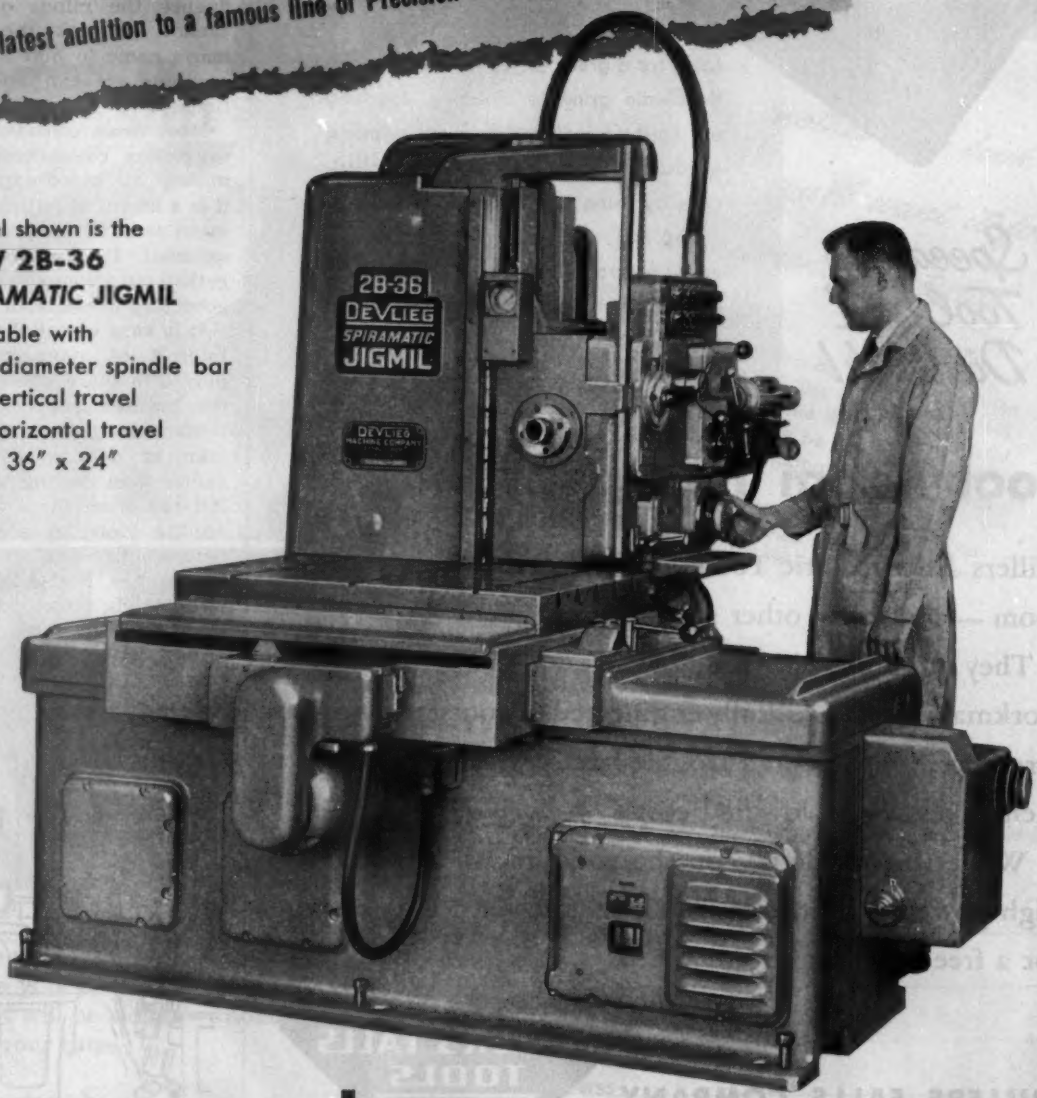
•

**The MODEL 2B-36**

**DE VLIEG *SPIRAMATIC* JIGMIL**

latest addition to a famous line of Precision Boring and Milling Machines

Model shown is the
**NEW 2B-36**
***SPIRAMATIC* JIGMIL**
available with
2½" diameter spindle bar
24" vertical travel
36" horizontal travel
Table 36" x 24"




*WRITE FOR ILLUSTRATED CATALOG*

**DE VLIEG MACHINE COMPANY**
450 Fair Ave., Ferndale • Detroit 20, Michigan

**HIGH SPEED**
**HAND DIE GRINDER**

Ideal for a great variety of hand operations—die grinding, finishing, touching up, finishing molds, deburring, grinding welds . . . also for many special applications by using special jigs and fixtures.

1/6 H.P., yet weighing only 2¾ lbs., easily controlled due to small diameter and excellent balance. Chucking capacity ⅛", 3/32" and ¼".

*Speeds up Tool and Die Work!*

# Tool Room Indispensable

Millers Falls Electric Tools are indispensable in the tool room — and many other spots in your plant.

They are built with Millers Falls famous New England workmanship . . . skillfully engineered for outstanding performance, long life and trouble-free service. They pay for themselves fast in lowered costs.

Write for full details on the wide line of Millers Falls high-powered electric tools. Or, better yet, let us arrange for a free demonstration.

**MILLERS FALLS COMPANY**
Dept. AM-11 — Greenfield, Mass.

MILLERS FALLS TOOLS
SINCE 1868
*The Mark of Superiority*

cedure is a personal explanation by the foreman.

L Becker
*New York, NY*

IT IS TRUE that employees do not like changes even though it affects them only indirectly. They are especially resentful of unannounced changes. Management saves itself a lot of headaches by letting the employees know in advance of any changes and the reasons for them.

Wise management asks for ideas and suggestions. The fellow who sweeps the floor may come up with a good one. The bulletin board or a series of shop letters is as good a way as any to keep all employees informed to what is going on. A personal letter goes a long way to influence the minds of others. We cannot overlook the fact that a man's name to him is sweeter than any one we can find in the dictionary.

Most firms consider shop letters, suggestion committees, safety committees an added expense. Actually it is a means of letting the employee in on some of the problems of management. It is people working together for a common purpose. It is a good way to establish teamwork.

It is very essential to the common interest of management and employee to share ideas; the profits of the business support them both. I think management makes the mistake of dealing with individuals rather than dealing with the group. All too often these individuals are on the fence. A good relationship between line and staff is of utmost importance. Round-table discussions on methods, policy, ideas will create a smoothly operated organization.

A E Salmons
*Norristown, Pa*

*"I put it in there for guys who borrow my tools without asking."*

10 cold-finished
JALCASE
grades
J&L
STEEL
MEMORANDUM
Here's another new book by J+L...you'll want it for your reference material
NOTE:
Data on J&L's Jalcase include information on the superior machinability of this cold finished steel. Both speed of machining and the amount of metal removed per revolution can be substantially higher than with other steels of approximately the same mechanical properties.
Jalcase also gives longer tool life between grindings. In many cases the machined surface of a Jalcase part requires no subsequent finishing operation.

**J&L STEEL**

You can help us place a copy of this *new* book in your hands. Please give us your name and address. We'll do the rest. It will be *mailed* without cost to you—no intrusion on your time.

Jones & Laughlin Steel Corp., Dept. 402
3 Gateway Center, Pittsburgh 30, Pa.

Please send me a copy of your new Booklet, "10 Cold Finished JALCASE Grades."

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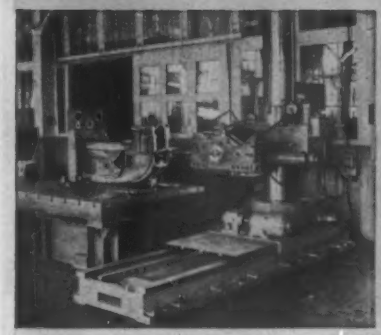
*Jones & Laughlin*
STEEL CORPORATION — *Pittsburgh*

# Horizontal Drilling Machines by Kaukauna AT WORK....



Performing quick, accurate drilling operations on press frame parts—drilling, fixture boring, tapping operations on milling machine columns—drilling all four parts of a tractor frame on a repetitive production line basis—these are the types of jobs illustrated, showing Kaukauna Horizontal Drilling Machines at work. The time and labor savings are of course apparent—elimination of expensive crane lifts, reduction in handling time, inexpensive tooling.

As illustrated, there is a Kaukauna Horizontal Drilling Machine in a size suitable for any class of work from small, high production jobs to extremely large work pieces. These extremely versatile machines make for greater work simplification and may be used to advantage in your shop for driving boring fixtures, drilling, reaming, boring, counterboring, tapping and spot-facing operations.

Kaukauna builds Universal Radial Drills and Horizontal Drilling Machines in a range of sizes which meet practically all requirements in modern production practice. Write today for descriptive catalog or ask representative to call.

KMC Kaukauna MACHINE CORPORATION
KAUKAUNA, WISCONSIN, U. S. A.

Order any of the full line of STAR Hand and Power Hacksaws, Metal and Wood Cutting Bandsaws and Hacksaw Frames from your Industrial Distributor.

Industry prefers STAR quality, prefers the blades made of carefully heat-treated, top-quality steel, fabricated on specially designed equipment—because STAR consistently delivers fast, economical metal cutting and long blade life.

Be sure to ask your Industrial Distributor for STAR "Moly"® High Speed Steel Blades. STAR developed this high speed, heavily-alloyed steel blade of molybdenum. Remember, "Moly" High Speed blades outlast standard steel blades 10 to 1, cut as well as the *best* high speed steel blades made, but are substantially lower in cost.

**FREE!** Ask your Industrial Distributor for a supply of our NEW Metal Cutting Booklets and Wall Charts.

® 1887

*Sold Only Through Recognized Distributors*

CLEMSON BROS., Inc.
MIDDLETOWN, N. Y., U. S. A.

Makers of Hand and Power Hacksaw Blades, Frames, Metal & Wood Cutting Band Saw Blades and Clemson Lawn Mowers.


## From the *American Machinist* Library of *Tips for Top Shop Men*

EVERY time you try something new, somebody will call it "a dangerous precedent." Remember that everything new is either wrong or a dangerous precedent to the timid. If you let such reasoning sway you, you'll never do anything new. Only ideas that aren't "dangerous precedents" are the duds.

# Cut the Tough Jobs Down to Size

No need to pamper these Atlantic Cutting Oils. Put them to work on the toughest cutting job in the shop. Then see the difference they can make . . . in long tool life, top production, even in shop morale.

Notice how Atlantic non-soluble cutting oils give you high production on hot, tough jobs — and without foul odors. Note, too, that the work is visible right through the oil. All these oils are compatible when blended.

Operators like Atlantic Cutting Oils because they do not indelibly stain hands and clothing . . . they make a cleaner shop possible.

You can get full information on these oils and a copy of the valuable new Cutting Oil Selector Chart, which shows how to select the right Atlantic Cutting Oil for the job. Just write for your copy to a nearby Atlantic office, listed here, or to The Atlantic Refining Company, 260 South Broad Street, Philadelphia 1, Pa. Dept. R-12.

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**READING, PA.,** First and Penn Avenues
**SYRACUSE, N. Y.,** Saline and Genesee Streets
**PITTSBURGH, PA.,** Chamber of Commerce Bldg.

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**PROCESS PRODUCTS**

# KOPING

## HIGH SPEED LATHE
### 28" SWING

# S 14 AL

**An outstanding example of Swedish precision craftsmanship. The S14AL is only one of the great variety of Koping's lathes now available.**

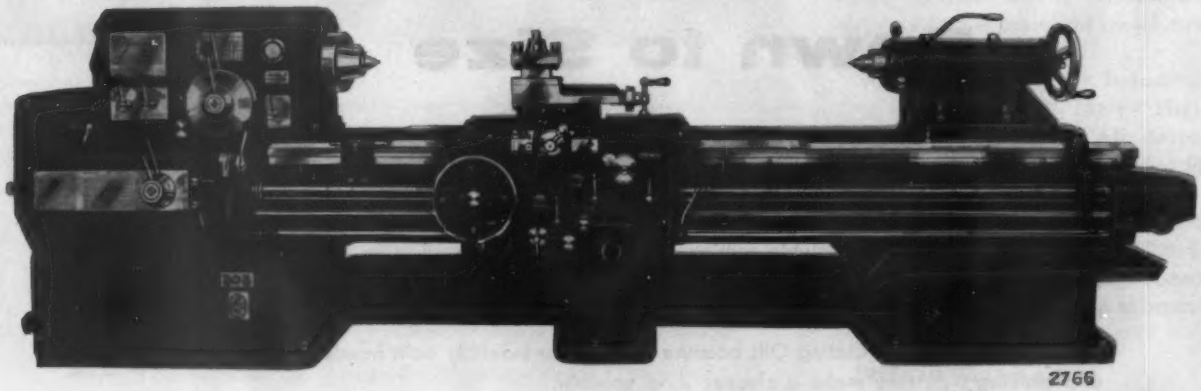
**Write, outlining your needs, for complete details on Koping's lathes for *your* particular requirements.**

## SPECIFICATIONS

| | |
|---|---|
| Swing over bed | 28" |
| Spindle speeds, number | 18 |
| Spindle speeds in geometric progression | 11.4-600 r.p.m. |
| Thread pitches for inch threads, number | 81 |
| Threads per inch, range | .125-60 |
| Thread pitches for millimeter threads, number | 71 |
| Millimeter pitch, range | .2-120 m.m. |
| Motor | 20 or 30 HP |
| Net weight w.o. motor | 9700 lbs. |

Extra equipment available

- Taper Turning attachments
- Profiling attachments
- Rapid Saddle Traverse
- Load Indicator



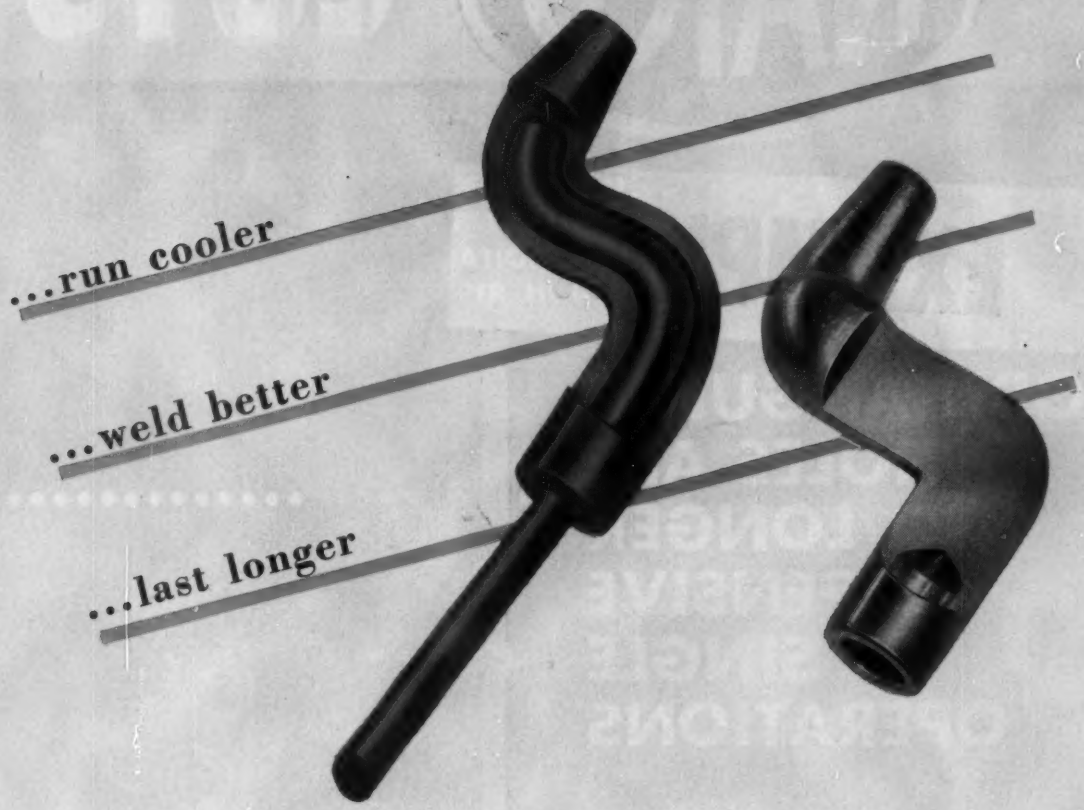
2766

**KOPINGS MEKANISKA VERKSTADS A.B.**
**SWEDEN**

**U.S. REPRESENTATIVE**
Homestrand INCORPORATED
LARCHMONT, N.Y.

Note: Dealer inquiries invited. Several territories available.

# MALLORY Cold-formed Electrodes




By means of special cold forming techniques, Mallory produces single-bend, double-bend and irregular shaped electrodes which have properties superior to those obtainable by conventional casting or hot forging.

**They run cooler**—because the cooling water tube goes closer to the tip. The tube can be bent in place*, and thus follows the shape of the electrode. The exclusive Mallory fluted cooling hole, which provides increased cooling area, can also be provided in these irregular electrode shapes.

**They weld better**—because cold forming develops strength and hardness considerably higher than that of cast or forged metals.

**They last longer**—because the combination of cooler operation and higher strength add up to longer runs between dressing . . . lower cost per weld.

Scores of "special" shapes can be produced promptly and at economical cost from Mallory's standard tools. You will probably find the exact style your application needs, in the Mallory series. For technical data, or for a consultation on your welding problems, call your local Mallory Welding Distributor . . . or write to Mallory today.

***Expect more . . . Get more from***

P. R. MALLORY & CO. Inc.
**MALLORY**
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

**Serving Industry with These Products:**

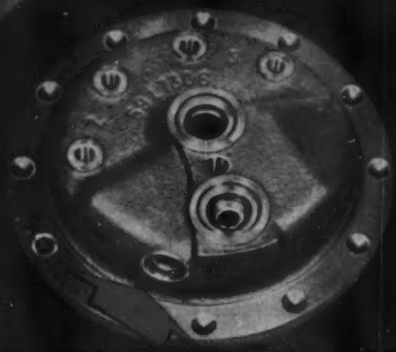
**Electromechanical**—Resistors • Switches • Television Tuners • Vibrators
**Electrochemical**—Capacitors • Rectifiers • Mercury Batteries
**Metallurgical**—Contacts • Special Metals and Ceramics • Welding Materials

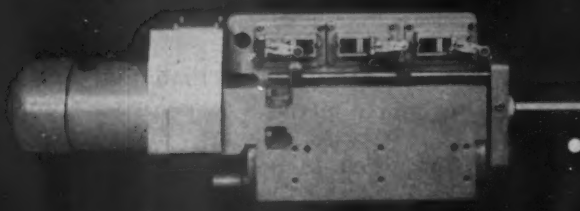
*Patent No. 2,489,993

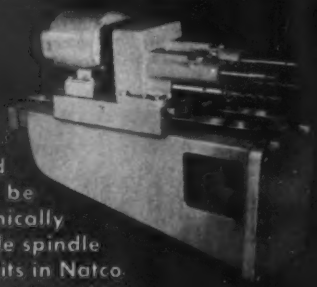
# NATCO CUTS

## EXAMPLES!

## ODD ANGULAR HOLES ARE NO LONGER EXPENSIVE SINGLE OPERATIONS







**NATCO DRILLING UNITS**

The machining of odd angular holes can be accomplished economically by incorporating single spindle drilling or tapping units in Natco machines or your present machines.

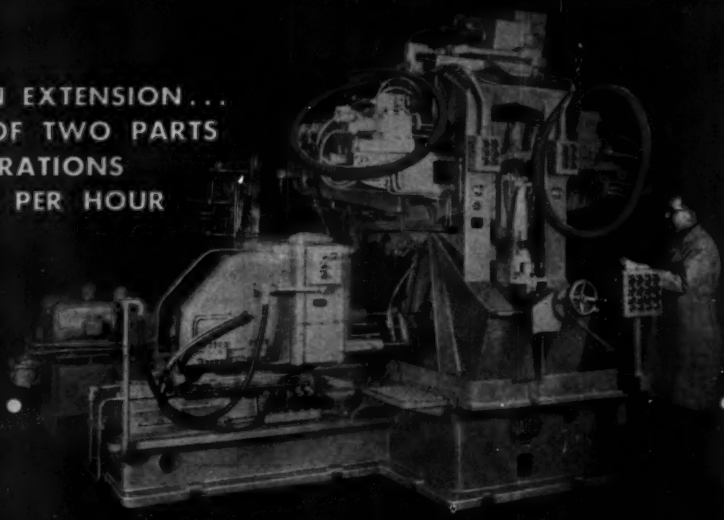
*for answers to your Drilling, Boring, Facing and Tapping problems*

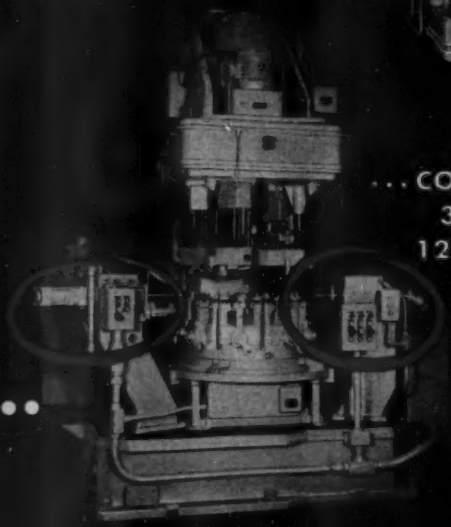
*Call a Natco Field Engineer*

CHICAGO, Room 203, 6429 W. North Ave., Oak Park
DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon

# DRILLING COSTS

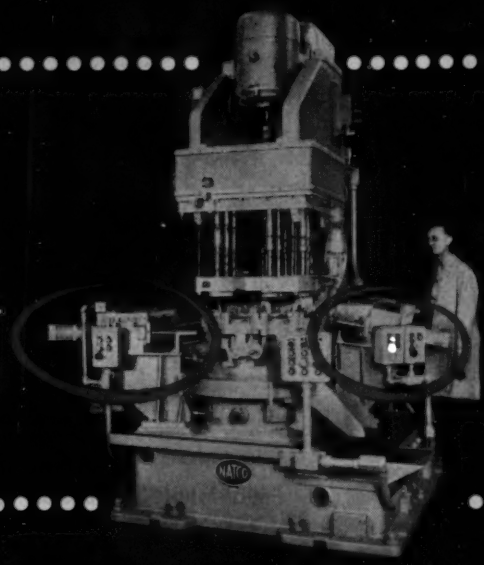
TRANSMISSION EXTENSION...
EITHER ONE OF TWO PARTS
14 OPERATIONS
120 PARTS PER HOUR





...COMPRESSOR HEAD
39 OPERATIONS
124 PARTS PER HOUR

COMPRESSOR CYLINDER...
17 OPERATIONS
80 PARTS PER HOUR

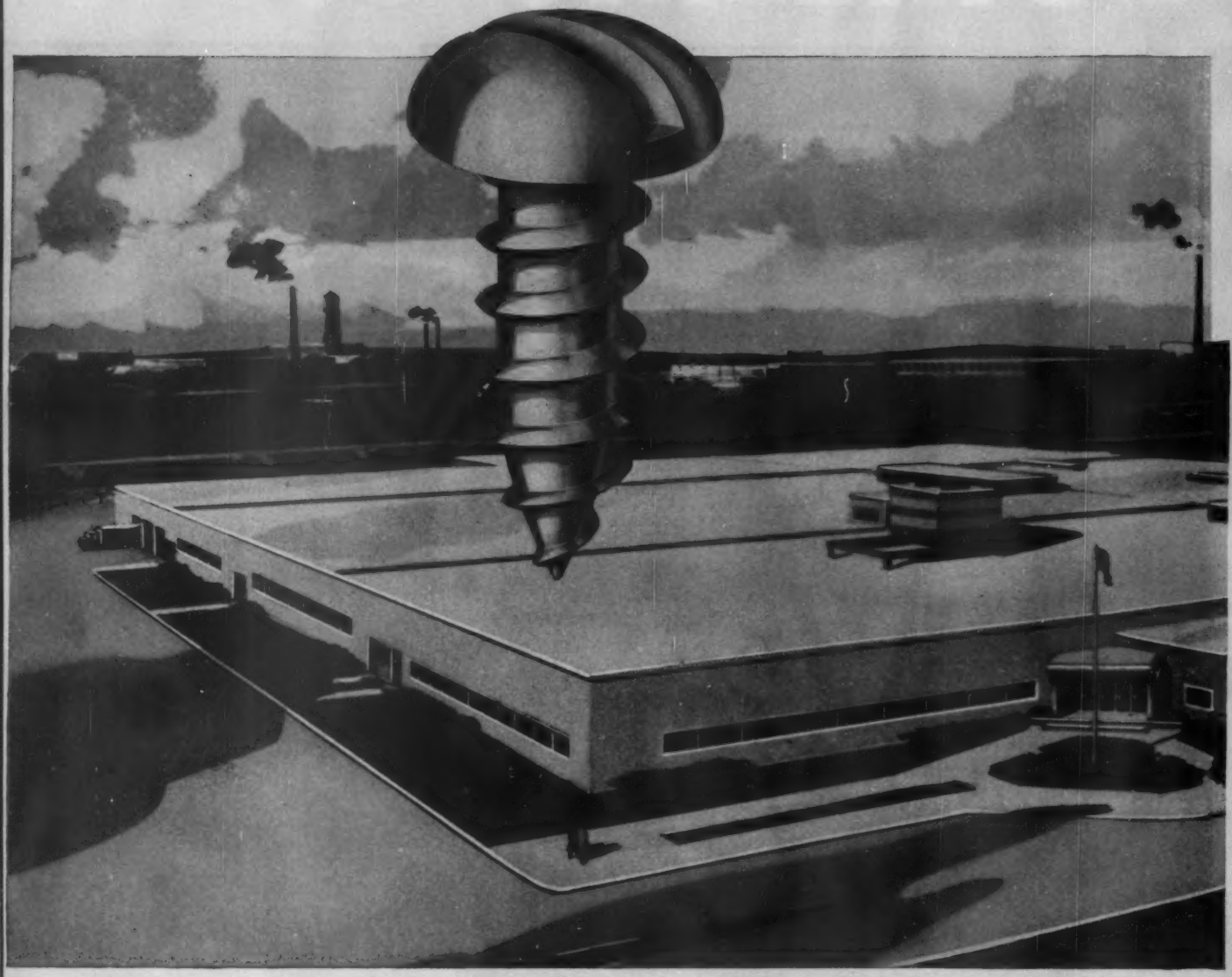


**NATIONAL AUTOMATIC TOOL COMPANY, INC.**

RICHMOND, INDIANA

NATCO

# the new PARKER



**IN CLIFTON, N. J.** About 10 miles from New York City.

**267,000 SQUARE FEET** of floor space, with 225,000 sq. ft. for manufacturing: the remainder for offices, shipping, etc.

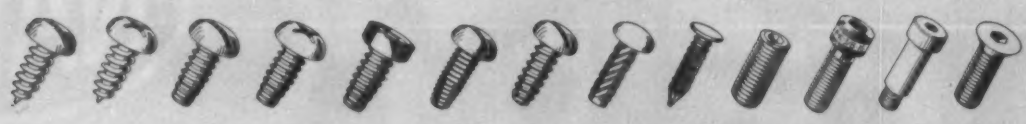
**PRODUCTION-FLOW DESIGN** Single-floor layout that permits progressive flow of products through processing operations.

**MECHANIZED MATERIALS-HANDLING** Special conveyor systems and other modern equipment provide advanced degree of automation, and speed production.

**AUTOMATIC HEAT TREATING** equipment, of P-K design, is typical of new production facilities for highest efficiency.

**ADVANCED QUALITY CONTROL** Newest inspec-

SELF-TAPPING SCREWS • SOCKET SCREWS • SCREWNAILS • MASONRY NAILS



# -KALON® plant . . .

**Production facilities matched with an unequalled experience . . . to offer you more assembly savings**

Starting with a revolutionary idea, the *original* Sheet Metal Screw, Parker-Kalon has become the leading manufacturer of Self-tapping Screws and other fasteners essential to low-cost assembly of thousands of the nations best-known products.

Industry's reliance on Parker-Kalon has brought about this growth, and the new Parker-Kalon plant, in a real sense, was built to your specifications.

In this great new plant, P-K Fasteners will be produced in larger volume to meet steadily increasing demand. Advanced engineering facilities will also contribute to P-K progress in research and development.

Parker-Kalon's unequalled "know-how" is now matched with the finest facilities for all operations. Now, more than ever, you can be sure . . . "If it's P-K . . . it's OK!"

tion and testing equipment guards P-K quality standards.

**PACKING AND SHIPPING** area is fully equipped for rapid handling of large stocks and shipment of orders.

**AIR-CONDITIONED LABORATORY** provides all modern requirements for research, fastener development, and performance tests.

**PARKER-KALON DIVISION**

**General American Transportation Corporation,**

**Clifton, New Jersey**

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STAPS* • WING NUTS • THUMB SCREWS

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# FOR THE FIRST TIME A COMPLETELY NEW DESIGN OF SMALL, LOW PRICE SCIAKY WELDERS

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- **Heavy, Fabricated Lower Arm**
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For complete details and specifications on the EP-1 projection welder, or SP-1 spot welder, write for Bulletin 324-2.

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A MESSAGE TO AMERICAN INDUSTRY • ONE OF A SERIES

*The National Merit Scholarship Corporation*

# Business is Offered Big Dividends on Investment in Higher Education

**The McGraw-Hill Publishing Company is availing itself of the opportunity to establish ten National Merit Scholarships. They will be known as the McGraw-Hill Merit Scholarships. The scholarships are to be awarded to qualified candidates for a four-year college course in the fields of science, engineering and the other professions and the liberal arts. There will be no limitation, beyond the appropriate professional accrediting, on the college or university selected by a successful candidate. As part of a continuing program to aid higher education and educational institutions, McGraw-Hill is happy to be able to share in what it believes to be the constructive educational endeavor of the National Merit Scholarship Corporation.**

Business firms searching for a satisfactory avenue to provide financial aid for our colleges and universities now have a new opportunity of major importance. It is provided by the National Merit Scholarship Corporation, which has offered to devote $8 million to matching, dollar for dollar, gifts by business firms for college scholarships and supplemental gifts to the institutions where the scholarships are used.

The National Merit Scholarship Corporation, an independent agency financed initially by gifts of $20 million from the Ford Foundation and $500,000 from the Carnegie Corporation, has three major purposes which are closely related. They are:

1. To locate those of the nation's young men and young women who are best equipped to go to college.

2. When necessary, to help these young people go to college by giving them financial aid.

3. To help colleges and universities meet the full cost of the instruction of those to whom National Merit scholarships are granted.

At present about half of the nation's top high school graduates do not go to college. The principal reason is that they do not have the money required.

## To Save Unused Brain Power

The National Merit Scholarship Corporation will strive to eliminate this dangerous neglect of top-flight ability. To this end it is inviting the nation's high schools, numbering more than 24,000, to participate in its program by designating as available candidates for National Merit scholarships the top 5 percent of their senior classes. Those so designated are then invited to take a series of tests and to submit reports designed to assure selection of the very best talent in each state. The number of scholarships to be allotted to each state will be proportionate to the number of high school graduates in the state.

The winners, the total number of whom will be determined by the amount of money the Scholarship Corporation has available, will be eligible for awards. For those who need no financial help to go to college there will be honorary awards of $100. For those who must have help the Corporation will grant scholarships covering as much as necessary

of the cost of instruction and living expenses for a four-year college course.

## Colleges Get Financial Help

The provision of funds to cover the students' expenses does not, however, solve the financial problems faced by many colleges. That is because the tuition charges paid by the students do not cover the cost of the instruction. The deficit must be met by drawing upon endowment funds, gifts, grants, and other available sources.

Consequently, to prevent holders of National Merit scholarships from imposing any additional financial burden on the colleges and universities they elect to attend, the Corporation will make a supplementary grant to these institutions. The supplementary grant will be the equivalent of regular tuition charges made by the school, with a top limit of $1,500 a year for both the tuition and the supplement.

As the scholarship grants to the winning students will vary, depending upon how much financial help they need, so will the supplementary grants vary from one college to another, depending on their regular tuition charges. However, it is anticipated that on the average the full cost of a National Merit scholarship—including aid to the student and the supplement to the college—will be about $1,500 a year.

Many business firms will find a compelling appeal in a program which is designed at once to mobilize the nation's intellectual resources more effectively and, in the process, give very badly needed financial help to our colleges and universities.

## Two For One Return Offered

However, there are numerous other inducements to business firms to finance National Merit scholarships. These scholarships may:

1. Carry the name of the firm or be named in honor of someone designated by the firm.
2. Be limited to use in types of colleges of particular interest to the sponsoring firm.
3. Be limited to a college course, such as science, engineering or liberal arts, of special concern to the sponsor.
4. Be restricted to candidates or institutions in geographic areas specified by the sponsor.

In addition to these advantages there is a special financial inducement to help the Merit Scholarship program. It is that for every Merit scholarship a firm or individual finances, the Corporation will, up to the limit of $8 million, match the funds and make another National Merit scholarship available.

There are many good ways of helping our financially beleaguered colleges and universities, and many corporations are already using one or more of them.* For those companies that can do so without embarrassing complications one of the best ways is to make unrestricted gifts directly to the institutions. But this new way provided by the creation of the National Merit Scholarship Corporation (Address: 1580 Sherman Avenue, Evanston, Illinois) has the broad appeal of serving two purposes of transcendent importance simultaneously. The purposes are to see that our best brains are fully trained and utilized and that our colleges and universities, crucial contributors to this process, are helped at the same time. Business will serve the nation and its own community well by giving the National Merit Scholarship Corporation generous help.

---

* These, as well as the plight of our colleges and universities, are discussed in a pamphlet, "Business Aid to Our Colleges and Universities," which embodies a series of five editorials which appeared in all McGraw-Hill publications. Copies of the pamphlet can be obtained without charge by addressing the Department of Economics, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, New York.

Methods of helping our colleges and universities financially are also outlined and discussed in a pamphlet, "Aids to Corporate Support of Higher Education," which may be obtained without cost by addressing the Council for Financial Aid to Education, 6 East 45th Street, New York 17, New York.

*This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.*

*Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.*

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

# QUIET

## "Magnamatic" controlled torque screwdriver at work!

CP One-Shot "Magnamatic" is the quietest screwdriver-nutrunner ever developed! Clutch buzz and ratcheting have been eliminated and exhaust noise is effectively muffled by a new principle of baffling.

Quiet One-Shot "Magnamatic" is an air-driven screwdriver-nutrunner that can be set to run nuts and screws to specified torque. Here's how: The Alnico magnetic One-Shot clutch, adjustable to specified torque, disengages completely the instant the fastener is driven to desired tightness. Maintains the selected torque setting indefinitely—prolongs clutch jaw life. Inexperienced operators don't burr screw heads, strip threads, shear fasteners, or damage work. Screw bits last longer.

***Only Quiet One-Shot "Magnamatic" has Torque Control PLUS all these advantages:***

- Doesn't require frequent readjustment to hold torque value.
- Completely disengages the instant the fastener is run to desired tightness.
- Eliminates stripped threads, sheared fasteners, surface damages.

**CAPACITIES:** #4 screws to ⅜" bolts.
Reversible and non-reversible types.

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- ☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories."
- ☐ Please send me "Magnamatic" Bulletin SP-3126.
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# Three aluminum screw machine parts

**$54.42 SAVED!**

**Two case pillars per clock.** Cost of parts for 10,000 clocks:

| | | |
|---|---|---|
| Brass . . . . | $96.00 | |
| Less scrap recovery . . | 6.66 | |
| | | $89.34 |
| Aluminum . . | $35.84 | |
| Less scrap recovery . . | .92 | |
| | | 34.92 |
| SAVED WITH ALUMINUM . . . . . | | $54.42 |

**$69.90 SAVED!**

**Three movement pillars per clock.** Cost of parts for 10,000 clocks:

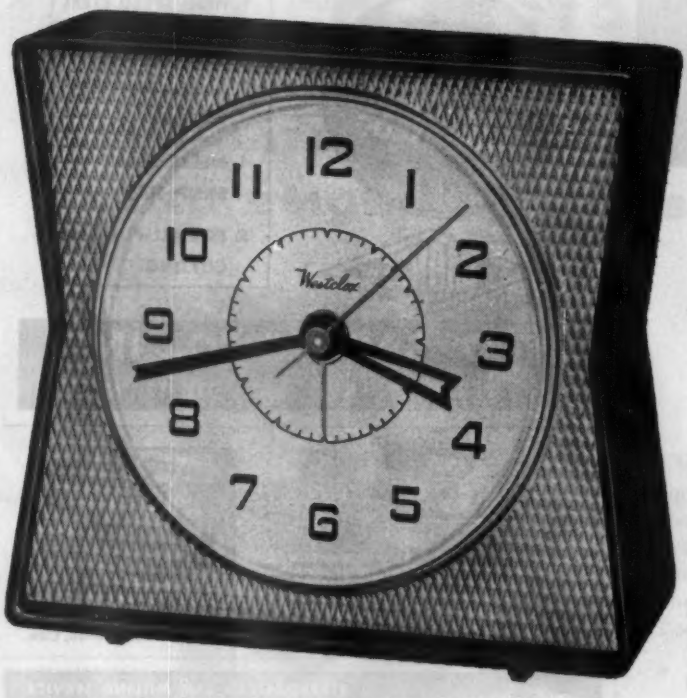
| | | |
|---|---|---|
| Brass . . . . | $120.96 | |
| Less scrap recovery . | 12.48 | |
| | | $108.48 |
| Aluminum . | $ 40.32 | |
| Less scrap recovery . | 1.74 | |
| | | 38.58 |
| SAVED WITH ALUMINUM . . . . . | | $ 69.90 |

**$9.08 SAVED!**

**One hour wheel bushing per clock.** Cost of parts for 10,000 clocks:

| | | |
|---|---|---|
| Brass . . . . | $32.16 | |
| Less scrap recovery . . | 12.49 | |
| | | $19.67 |
| Aluminum . . | $12.32 | |
| Less scrap recovery . . | 1.73 | |
| | | 10.59 |
| SAVED WITH ALUMINUM . . . . . | | $ 9.08 |

# save money for WESTCLOX




**WESTCLOX MANAGEMENT SAYS:**

"We recommend that aluminum be used in all cases where it can save us money, as it does with the three parts shown here. Lower raw material costs without any sacrifice in machining time is the main reason for the savings we get with aluminum."

**WESTCLOX ENGINEERING SAYS:**

"In addition to its economy, we find that aluminum is often more suitable for certain parts than brass or steel."

**WESTCLOX PRODUCTION SAYS:**

"We find that aluminum screw machine stock machines easily and has equal or better machining rates than other metals. No special tooling or other preparation is required."

THE EXPERIENCE of Westclox, Division of General Time Corporation, is more evidence of this important fact: *you can recommend aluminum parts with confidence.*

This can mean more business for you because you can usually offer a *lower bid* in aluminum, often with better quality. Even when specifications call for another material you should always offer a bid in aluminum.

Remember that you get *three times* as many parts from a pound of Kaiser Aluminum stock as from a pound of brass or steel. That's why each part can cost far less!

In addition, Kaiser Aluminum stock often permits other important economies that help you offer lower bids. It eliminates expensive plating. It extends tool life. It reduces cleaning costs, because lightweight aluminum chips easily "float from cavities." And its light weight greatly reduces shipping charges and cuts the cost of material and process handling.

For more information or assistance, look for our local number in the classified telephone directory under the heading "Aluminum" or contact one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

# Kaiser Aluminum

**setting the pace—in growth, quality and service**

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"Machining Kaiser Aluminum" contains complete technical data and tooling information for automatic screw machines. For your copy, write: Technical Editor, Kaiser Aluminum & Chemical Sales, Inc., 228 North La Salle Ave., Chicago, Ill.

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ARE IN DEMAND
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4. MEETS EVERY SHOP TEST
5. FOR ALL-PURPOSE CUTTING

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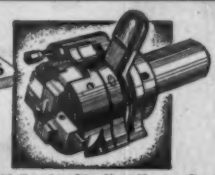
H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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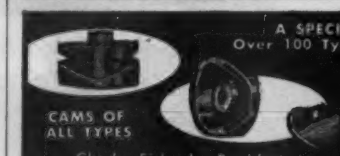
Pacific Coast Rep: A. C. Berhringer, Inc., 224 N. San Pedro St., Los Angeles, Calif. Canada: F. F. Barber Machinery Co., Toronto, Can.



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Contract production, Special automatic machines
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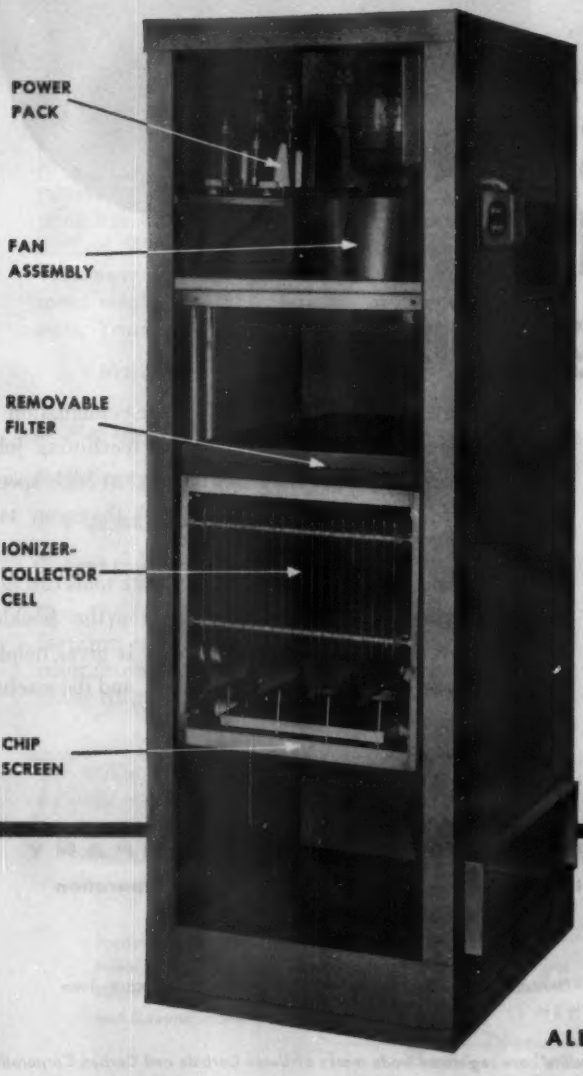
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

# Oil mist in your plant may be costing you thousands of dollars each year!

## ALL-NEW Electro-Staynew MIST COLLECTOR

Loss To Industry Estimated In Millions
Oil mist . . . that fine, almost invisible haze that floats around machine shops and metal working plants is costing industry millions of dollars annually.
The dollar loss isn't in wasted oil. Rather, it takes the form of lost man hours through sickness, high maintenance expense for removal of sticky residue from plant walls, floors and ceilings, and increased heating costs when exhausted outside the plant.

## ELIMINATES OIL MIST AND SMOKE AT THE SOURCE!




### A self-contained, "packaged" ventilating system for individual machine tools

Electro-Staynew Mist Collectors are specifically designed to be mounted on or near high speed machine tools. These Dollinger-engineered, electrostatic filters draw contaminated air from around grinding or cutting operations, *remove* over 90% of the oil mist and smoke, and then return clean air to the shop. Look at these exclusive advantages:

- **UNIT CONSTRUCTION**—Ionizing and collector cells are combined into one unit; thus only one unit to service.
- **EASE OF INSTALLATION**—needs only electrical and duct connections.
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- **ADVANCED SAFETY FEATURES**—assure complete protection of personnel.
- **MINIMUM MAINTENANCE**—designed to be practically self-cleaning.

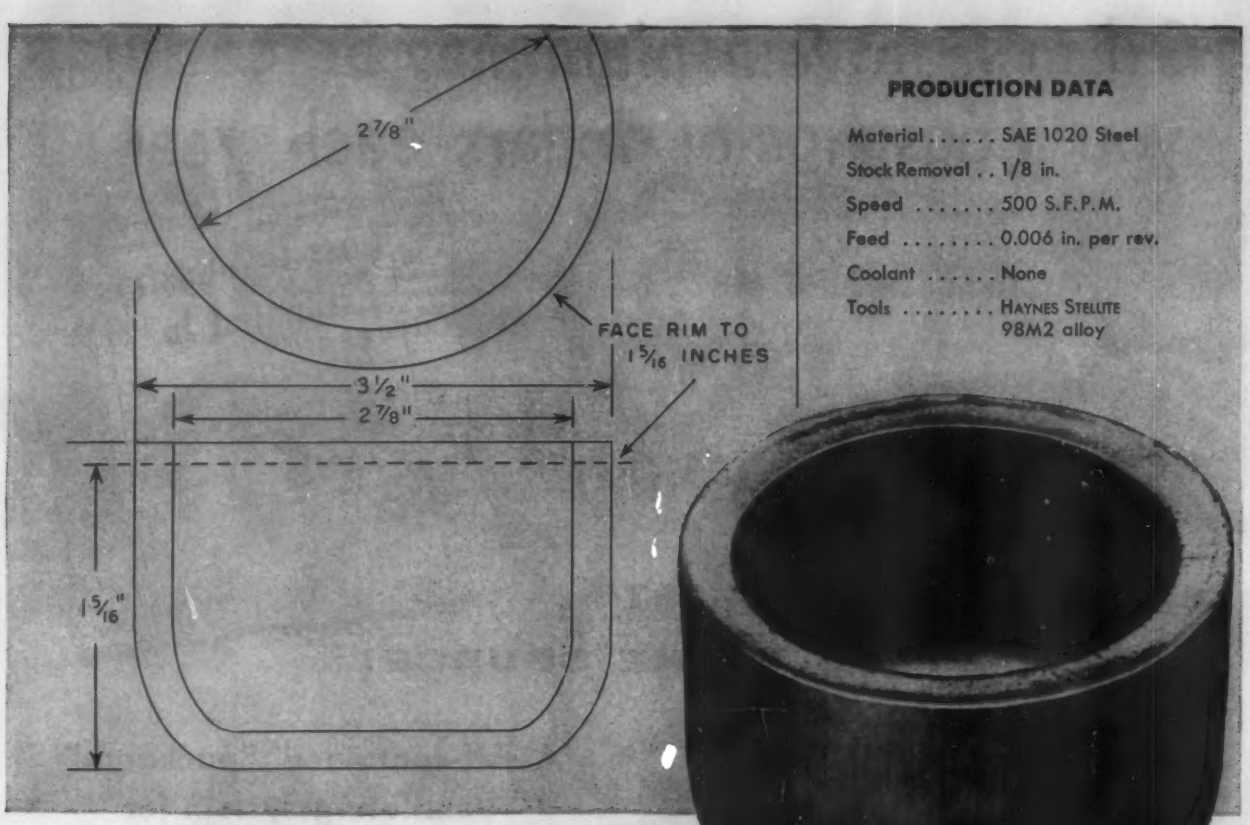
*For complete information, write today for Bulletin 420.*

DOLLINGER MIST COLLECTOR ELECTRO-STAYNEW

**DOLLINGER**

**CORPORATION • 93 Centre Pk., Rochester, N. Y.**

**ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED**


2 7/8"
FACE RIM TO
1 5/16 INCHES
3 1/2"
2 7/8"
1 5/16"
PRODUCTION DATA
Material . . . . . SAE 1020 Steel
Stock Removal . . 1/8 in.
Speed . . . . . 500 S.F.P.M.
Feed . . . . . 0.006 in. per rev.
Coolant . . . . . None
Tools . . . . . HAYNES STELLITE 98M2 alloy

# 1,000 PIECES MACHINED PER GRIND ...despite rough, uneven cut

HAYNES STELLITE 98M2 tools machine over a thousand of these torque converter cups between grinds. The cups are deep drawn from SAE 1020 steel, and are plunge cut. The area to be machined is rough and uneven. The HAYNES STELLITE tools operate for a full eight-hour shift, at a speed of 500 surface feet per minute, without chipping or spalling. No coolant is used.

HAYNES STELLITE tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. This same combination of properties makes them valuable on all machining jobs. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they can take deep cuts.

For information on how HAYNES STELLITE tools can help speed up your machining jobs, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design, and the machinability of metals.

HAYNES TRADE-MARK ALLOYS

**HAYNES STELLITE COMPANY**

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## New 19 Inch Hydroform makes...

# large prototype and pre-production parts

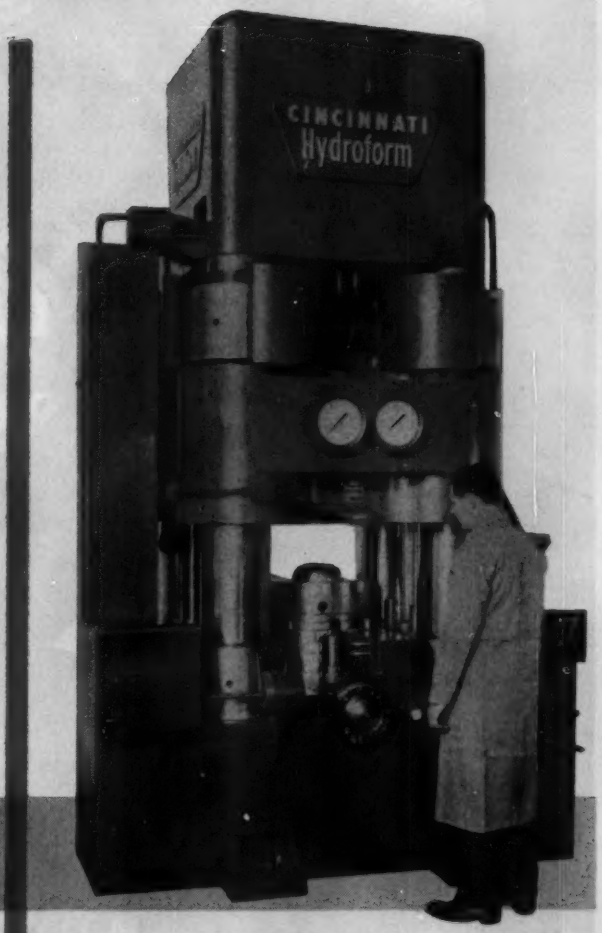
## ...now available by economical Hydroforming

The new 19" Hydroform is an important addition to Kaupp facilities. This new machine makes it possible to produce larger parts than heretofore possible on the 12" Hydroform previously installed. With both machines now in operation, a vast new field is open for design and development engineers who require prototype components. Your inquiries are invited.

*HYDROFORMING BY KAUPP SAVES TIME AND REDUCES TOOL COSTS —*

- **Fewer drawing operations**
- **Simple tooling**
- **Fast set-up**
- **Improved quality**

Specify Hydroforming by Kaupp for accurate forming and drawing of stainless steel, Inconel, aluminum, cold rolled steel, copper, brass and other alloys.




*NEW 19 INCH HYDROFORMING—WORK CAPACITY:*

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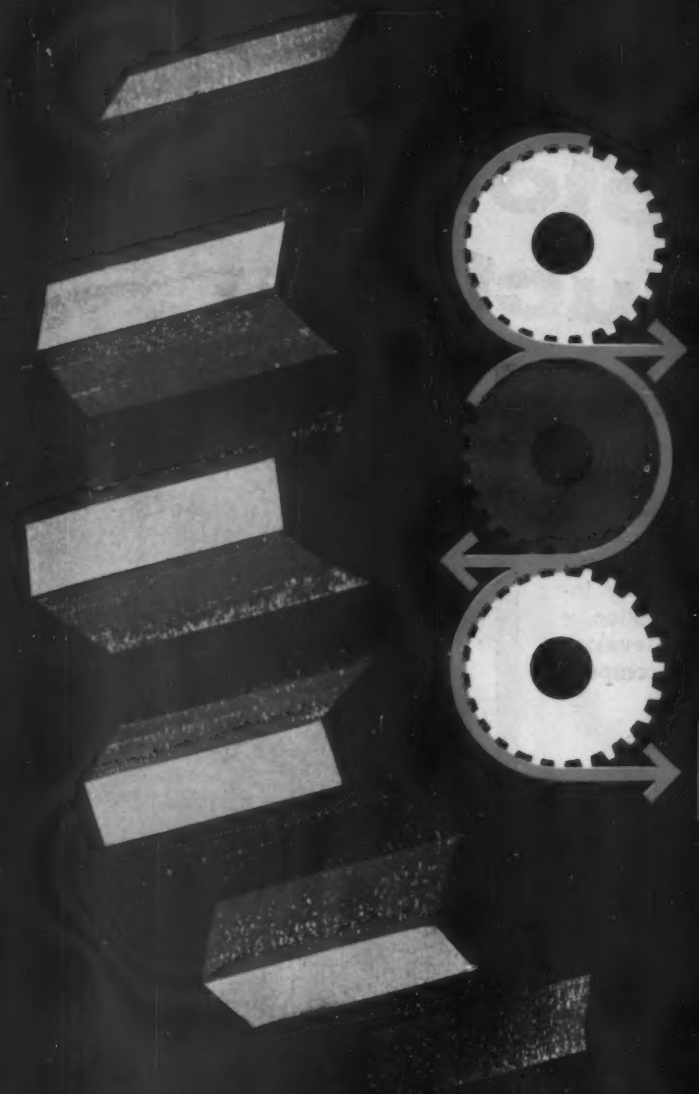
# 4150 steel is your best bet for heavy sections



Chromium Molybdenum Steel like AISI-SAE 4150 is the most economical way to uniform properties throughout heavy sections. For heavy duty gears — for shafts — wherever toughness and fatigue strength are important, *plentiful* 4100 Moly steels are better. We will prove it. Climax Molybdenum Company, 500 Fifth Ave., New York 36, N. Y.

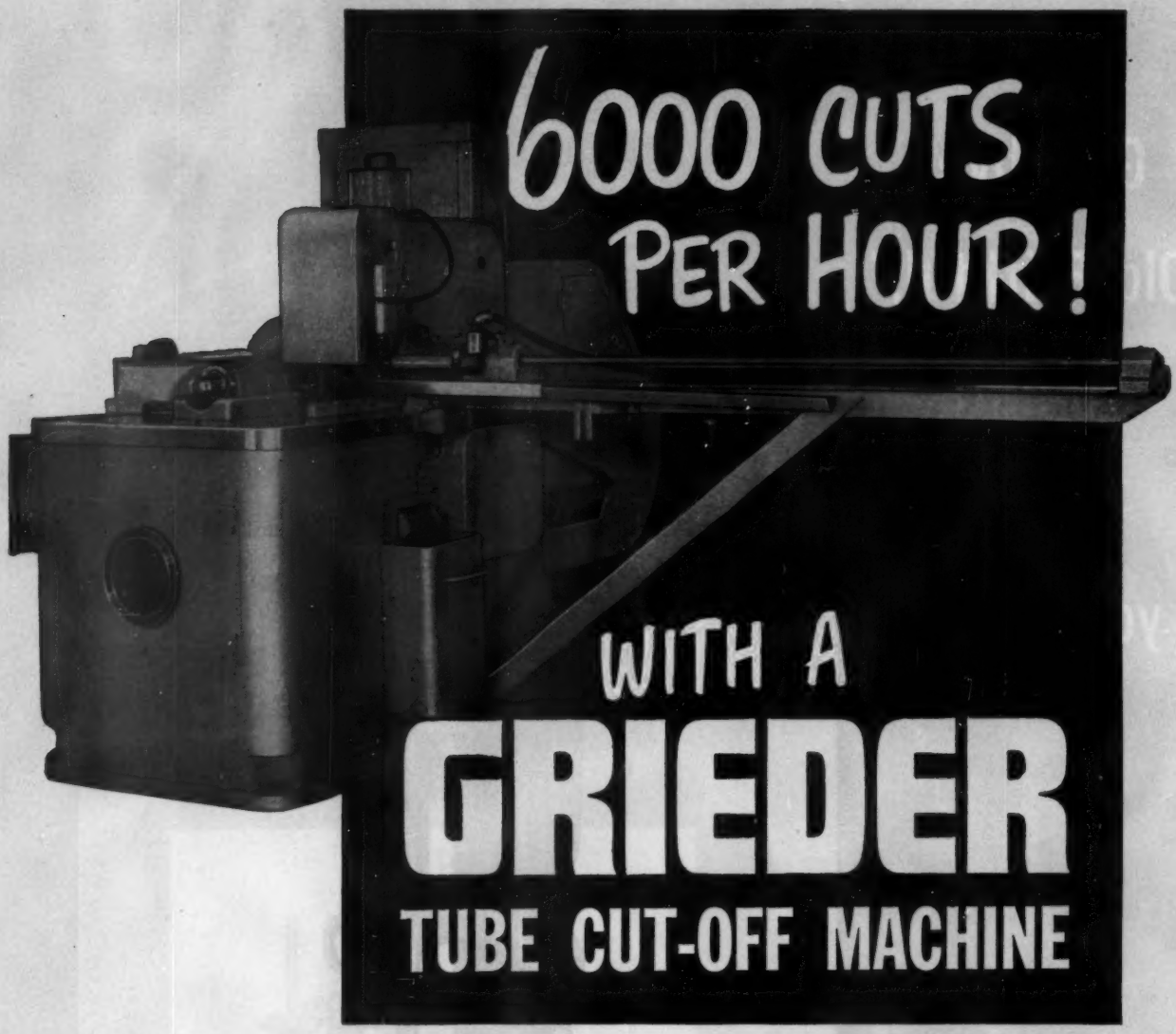
**AISI-SAE 4150**

| | | | |
|---|---|---|---|
| C 0.48/0.53 | Mn 0.75/1.00 | Pmax 0.040 | Smax 0.040 |
| Si 0.20/0.35 | Cr 0.80/1.10 | Mo 0.15/0.25 | |

4100 steels are your best bet

CLIMAX MOLYBDENUM

MS5.11



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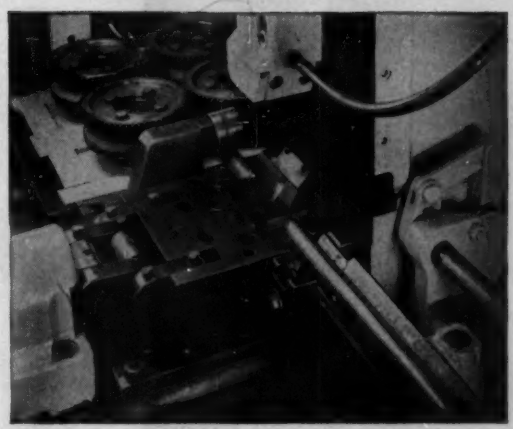
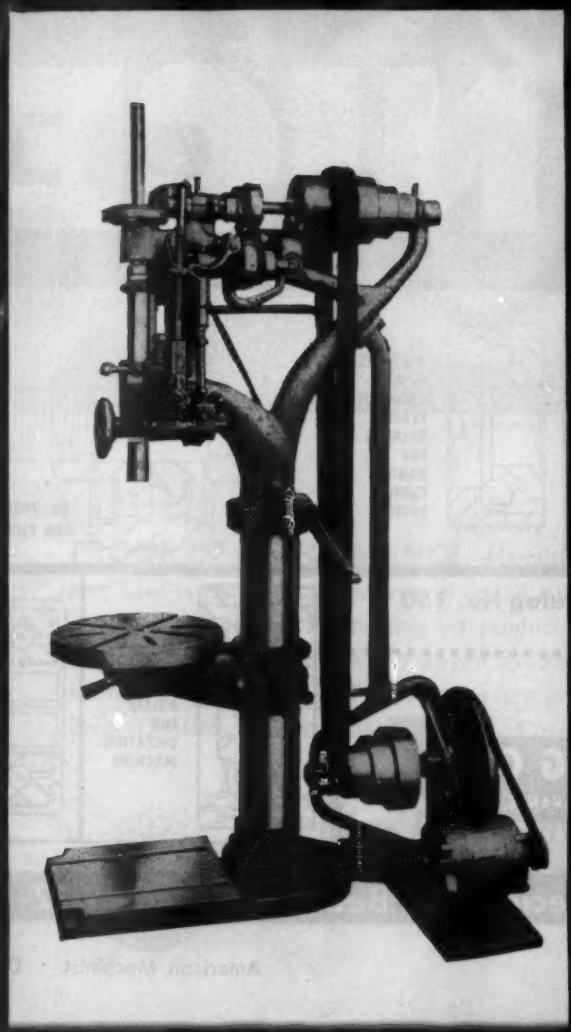
**ACCURACY WITHIN .002"...**
**CUTS ANY SHAPE...**

Cut steel tubing at the amazing speed of 6000 cuts per hour. The Grieder Tube Cut-Off Machine features a heavy duty air operated combination clutch and brake unit that allows continuous operation at this terrific rate of production. Fully automatic... Rate of feed: 600 feet per minute ...True cutting. Get full information, multiply your tubing production, reduce costs, write *today*.



**GRIEDER INDUSTRIES, INC.**
**BOWLING GREEN, OHIO**

Goodbye
"Old Faithful,"
we hate
to see
you go...



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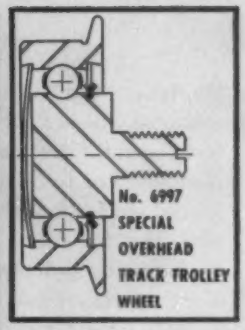
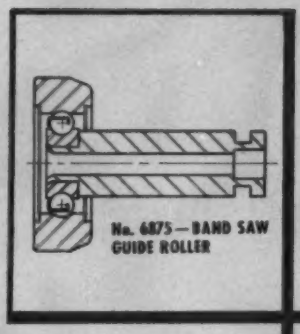
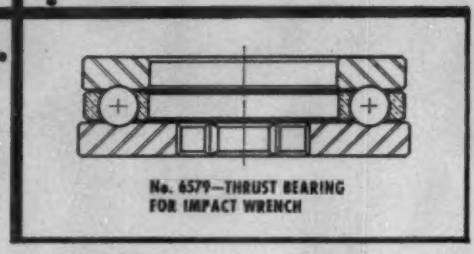


No. 6997 SPECIAL OVERHEAD TRACK TROLLEY WHEEL



No. 6875—BAND SAW GUIDE ROLLER



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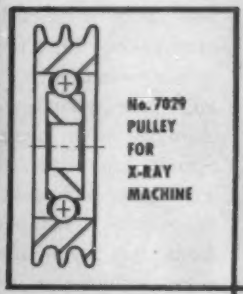
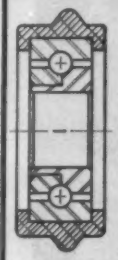
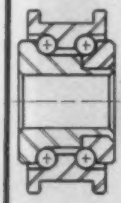


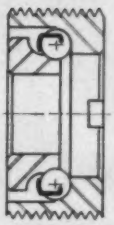
No. 7029 PULLEY FOR X-RAY MACHINE



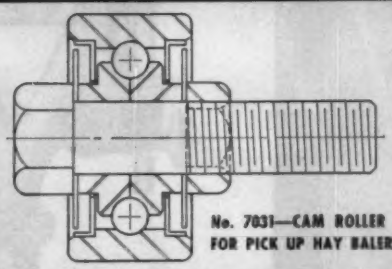
No. 7025 NYLON TIRED ZINC PLATED ROLLER FOR DISHWASHER



No. 6970 GUIDE ROLLER FOR SHEET METAL TRIMMER



No. 6959 THREADED O. D. CADMIUM PLATED BEARING FOR RADIO TUNING DEVICE



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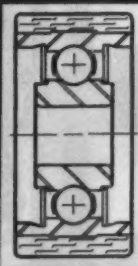

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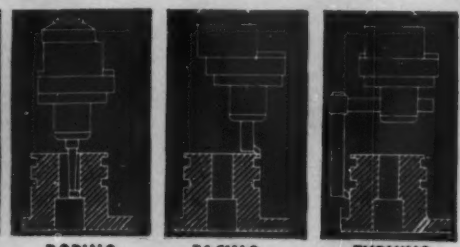

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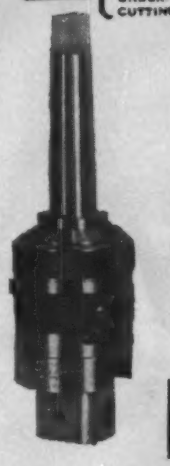

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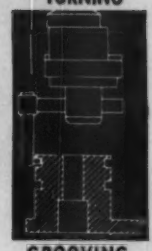

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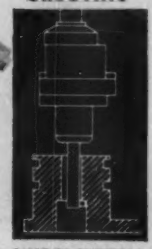

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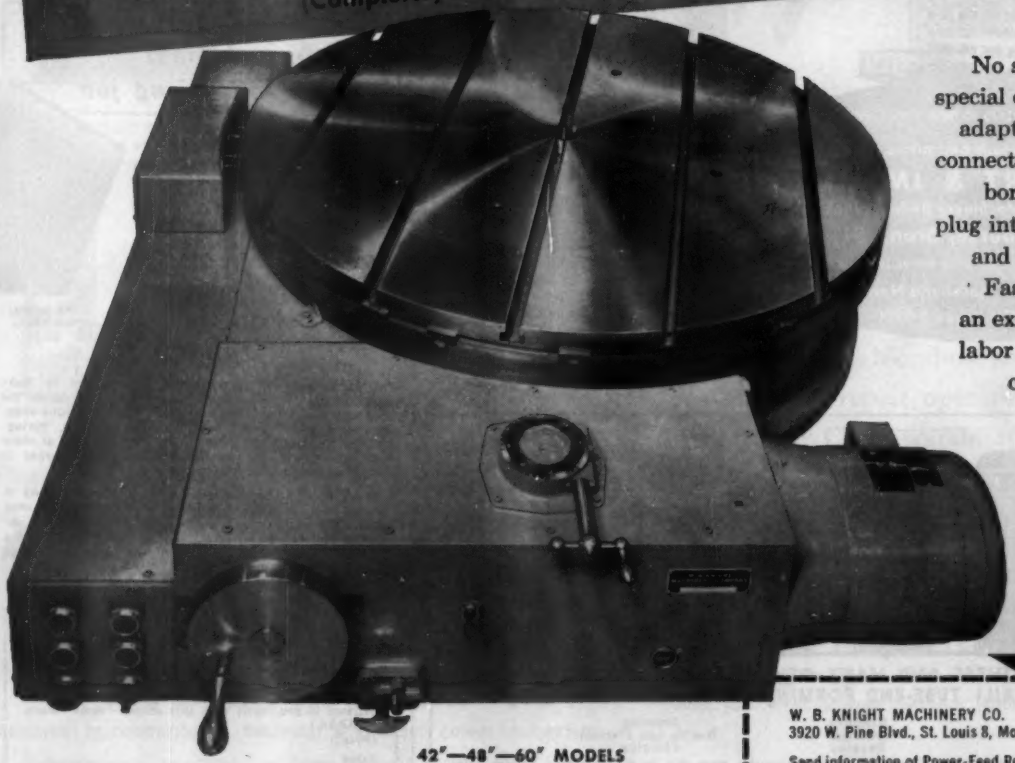

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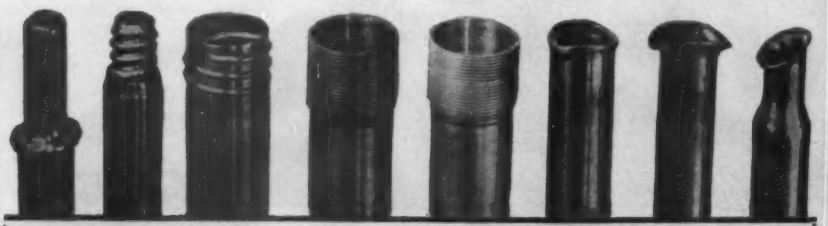

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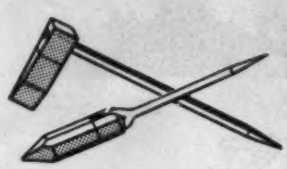

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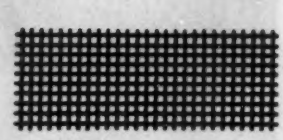

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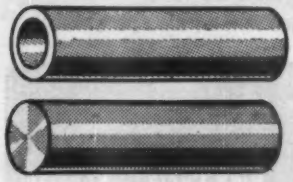

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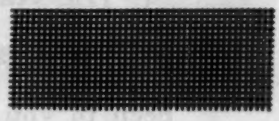

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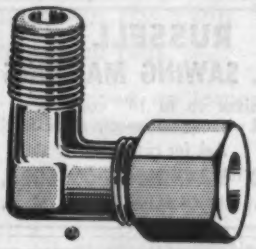

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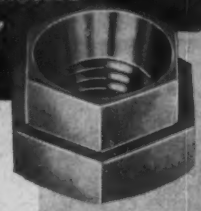

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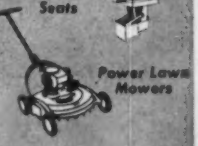
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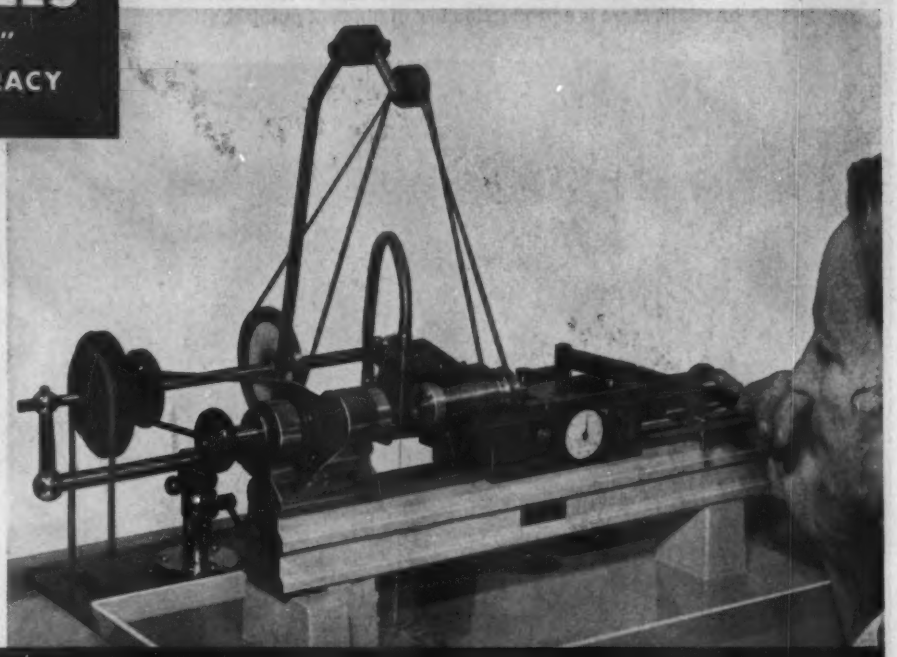

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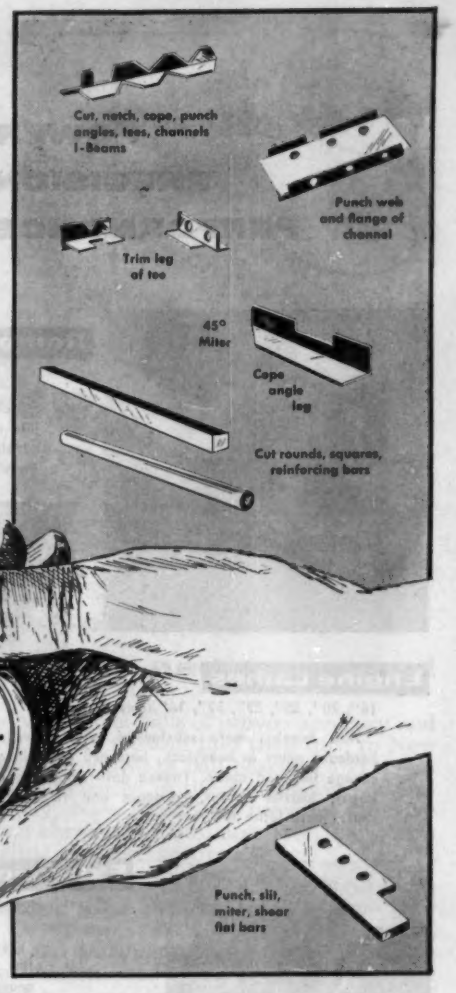
•

## "Buffalo" Universal Iron Worker


Cut, notch, cope, punch angles, tees, channels I-Beams
Punch web and flange of channel
Trim leg of tee
45° Miter
Cope angle leg
Cut rounds, squares, reinforcing bars
Punch, slit, miter, shear flat bars

Here's the one machine to do any or all of the above jobs *without changing tools.* The U.I.W. does the work of up to five machines, yet takes the floor space of only one. Think of the time a U.I.W. could be saving in your shop—cutting time of conveying work from machine to machine—setup time—pileup of jobs awaiting their turn. Many other exclusive "Buffalo" features such as independent built-in notcher and coper, instant miter adjustment to four angles, and one-shot lubrication give you typical "Buffalo" "Q" Factor* performance. *Write for Bulletin 360E today for all details.*

**The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.*

ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

**BUFFALO FORGE COMPANY**

509 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

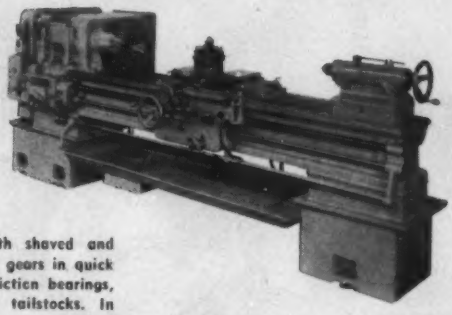
DRILLING • PUNCHING • SHEARING • BENDING

**POWER**
**PRECISION**
**PERFORMANCE**

**Removable Block Gap Lathes**

16"/27", 20"/30", 25"/40" sizes

Nebel removable block gap lathes provide the flexible swing capacity of a gap lathe . . . plus all the advantages of an engine lathe. Made in three sizes, there's one that will fit your requirements perfectly.



**Engine Lathes**

16", 20", 25", 27", 32", 36" sizes

Now heavier, more substantial, with shaved and hardened gears in headstock, hardened gears in quick change box and apron. Timken anti-friction bearings, larger, heavier aprons, carriages and tailstocks. In short, more lathe for your money!

**Extension Bed Gap Lathes**

20"/40" and 28"/50" sizes

28"/50" Nebel 'G' series shown, swings 52" through the gap, 29" over the ways. Shaved and hardened gears and Timken bearings throughout headstock. Takes 15- or 20-hp motor. Also made in 20"/40" 'AG' series. Both series now heavier, more accurate, faster and more powerful.

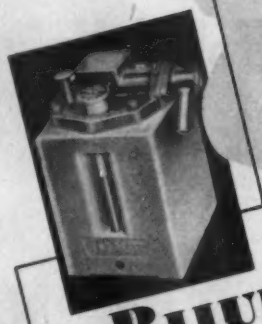
***For complete information and specifications on all Nebel lathes, consult Machine Tool Catalogs or write:***

**NEBEL MACHINE TOOL CORP.**
3409 Central Parkway • Cincinnati 25, Ohio


**From the *American Machinist* Library of *Tips for Top Shop Men***

MORALE isn't built in a crisis; it's built beforehand. The crisis only tests it.


**YOUR SILENT PARTNER**



**BIJUR**
**AUTOMATIC LUBRICATION**

HELPS YOU
• effect real savings in your own plant
• design savings into the equipment you make

Hand oiling is costly! It wastes time and money . . . steals valuable production hours . . . means extra down-time, fire risk, repair bills, replacement parts and causes product damage from excess lubricant.

But there's a way to end all this waste and worry. A Bijur Automatic Lubrication System never forgets a bearing . . . bearings never are thirsty for oil, never flooded. Lubrication is continuous, exactly right. All the hazards of hand oiling are banished—*automatically!*

Bijur Systems are custom-engineered for machinery used by practically all industries. Every bearing receives a clean supply of oil at the right time . . . automatically and correctly metered to suit its individual needs . . . while the machine is running! Whether for new equipment you *buy*, or machines you *build*, insist on Bijur. It's better—*by design!*

P-5

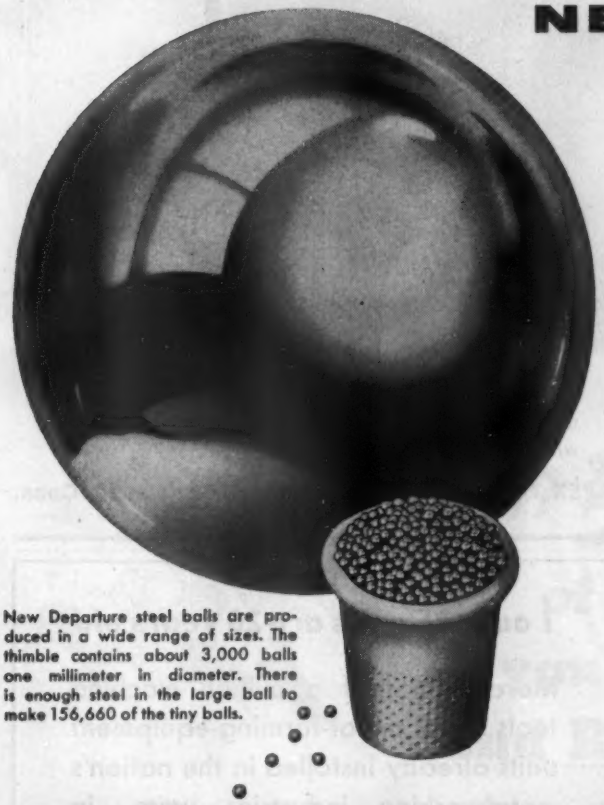
**BIJUR**
LUBRICATING CORPORATION
Rochelle Park, New Jersey
*Pioneers in Automatic Lubrication*

# FACTS

about

## NEW DEPARTURE

STEEL BALLS



New Departure steel balls are produced in a wide range of sizes. The thimble contains about 3,000 balls one millimeter in diameter. There is enough steel in the large ball to make 156,660 of the tiny balls.

### Available in any quantity to fit your specifications for grade, size and accuracy!

When industry wants steel balls of proven accuracy and dependability, it is only natural that they turn to New Departure, leading producer of ball bearings and therefore thoroughly experienced in the manufacture of precision balls. Today, New Departure provides industry with high-carbon chrome and stainless steel balls in a wide range of sizes and specifications.

New Departure balls are produced from the finest high-carbon chrome steel. AISI Type E51100 steel, specially made for New Departure, is heat-treated to achieve the proper hardness and toughness for maximum strength and life in the finished product. Stainless steel, AISI Type 440C, used by New Departure results in balls of much improved hardness and load-carrying ability.

In addition to producing the finest steel balls available, New Departure will fill volume orders for balls of special materials such as high-nickel or cobalt-base alloys, tool steel and others.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

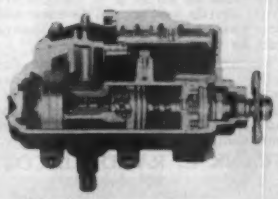
Steel ball wire is drawn through dies to assure uniform diameter and roundness.

Precise control of grain flow is obtained with these Ball Heading Machines.

Balls are heat-treated, quenched in oil or water, then tempered in electric furnaces.

These gauges sort balls into lots according to required diameter limits.

### Applications range from power steering to pencils

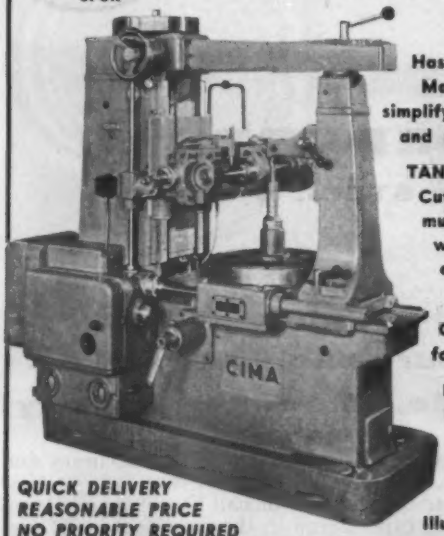


The unique advantages of New Departure steel balls are utilized in many applications ranging from heavy-duty bearings to the new liquid lead pencil. To accommodate these applications, New Departure steel balls are offered in sizes ranging from .025 inch to 1⅞ inches in diameter.

**CIMA UNIVERSAL GEAR HOBBING MACHINE**

**CAPACITY 20" DIA. 5 D. P.**

SPUR SPIRAL WORM GEAR WORM




Has DIFFERENTIAL Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs CLIMB CUTTING for better finish.

Power Feed and Rapid Return in all directions - Quick set-up.

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*QUICK DELIVERY*
*REASONABLE PRICE*
*NO PRIORITY REQUIRED*

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COMPLETE LINE OF PRECISION INSTRUMENTS
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**APEX TOOLS**

**"APEX" HEAVY-DUTY CUTTERS IN STOCK**

We carry stock cutters for face milling, slotting or straddle milling. Your inquiries invited.

"APEX" manufactures inserted tools and milling cutters of all styles. Carbide-tipped cutters furnished when required.

**APEX TOOL & CUTTER CO., Inc., Shelton 10, Conn.**



*Wolverine*

Heavy Duty
**QUICK ACTION TOGGLE CLAMPS**
***Extra CLEARANCE***
***Extra SPEED***
and now
***Extra SERVICE***
assured by the use of
**HARDENED PINS & BUSHINGS**
at all bearing points, in the popular C-100, CQ-1100, and CQ-800 series Toggle Clamps.

Rugged construction—drop forgings, cast steel and solid bar stock.

Wolverine Toggle Clamps also available in several types and sizes of Standard Action and Push Action units.

*Write for Bulletin*

**WOLVERINE TOOL CO.**
1484 E. WOODBRIDGE
DETROIT 7, MICHIGAN



***1 out of 5 units are 20 years old***

More than half a million machine tools and metal-forming-equipment units already installed in the nation's metalworking industries were, in 1953, over 20 years old. Did your plant help boost the 1 out of 5 average?

**RANDALL and STICKNEY Dial Gauges and Indicators**

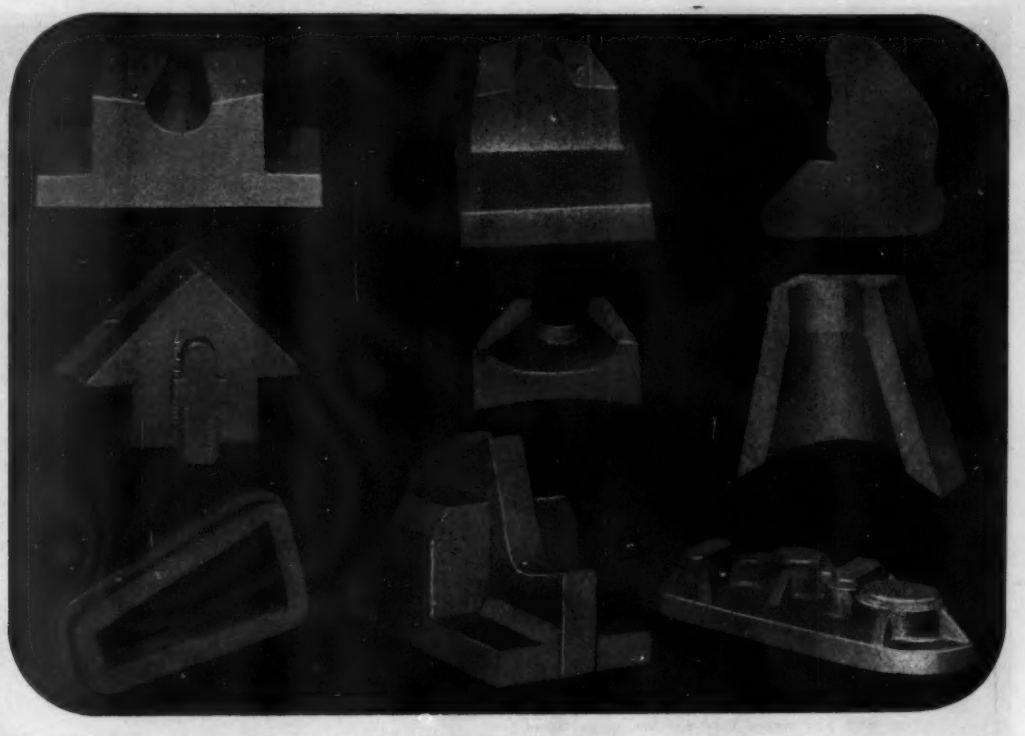
are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2½" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
*Makers of Dial Gages Since 1896*



# *In this method*

## of Tool and Die Making —you Buy Less Steel and Reduce Machining Costs

**SEND FOR THIS NEW CATALOG**
***"FORGING AND CASTING PRODUCTS"***

It's hot off the press with full details on FCC Air Hardening, Oil Hardening and other Cast-to-Shape Tool Steel Specialties that can save you time and money . . . also Composite Die Sections, and Smooth-Hammered Forgings in a wide range of tool and stainless steels. *Don't wait—get your copy NOW.*

***Write Today***

**ADDRESS DEPT. AM-72**

FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

● Allegheny Ludlum Steel Corporation, Forging and Casting Division, Wanda and Jarvis Avenues, Detroit 20, Michigan.

For complete **MODERN** Tooling, call

# Allegheny Ludlum

WAD 8076

AL
FINE TOOL STEELS SINCE 1854

*A Quick, Smooth, Uniform coating—assured by*

## BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With the Barrett Whizo Galvanizer, excess metal is quickly removed from small parts after dipping in molten metal, in fact, much faster and more uniform production is assured. Parts will also pass the most rigid inspection for quality.

The method of handling is simple and easy. Work to be coated is placed in a round basket and submerged in molten metal. When thoroughly heated, the basket is placed in the Barrett Centrifugal to be immediately accelerated to high speed, the excess metal being thrown off before it can cool.

A quick pick up to full speed and stop (from 2 to 3 seconds each) assures maximum production with an even thickness of coating.

Machines furnished with or without heated surrounding drum, in capacities from 40 to 240 loads per hour, handling from 5 to 100 lb. loads. When used for tinning threaded work, rethreading has been found to be unnecessary.

Barrett Centrifugals are used extensively, combine speed with convenience of operation and the utmost in safety. They are highly developed to meet all reasonable requirements, have self-contained motor drive and occupy a minimum of floor space.

•

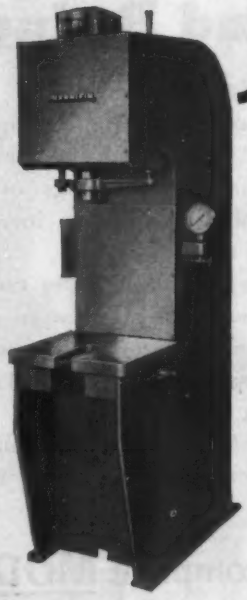
***Send at once for full details of Barrett Centrifugal Galvanizer***

THE LEON J. BARRETT COMPANY. 1800 Grafton Road WORCESTER. MASS.

Designers and Builders of Centrifugal Machinery

# PRICE LIST

## ON HANNIFIN STOCK HYDRAULIC PRESSES



| | |
|---|---|
| 1-TON | $ 552 |
| 2-TON | $ 627 |
| 5-TON | $1,286 |
| 8-TON | $1,581 |
| 10-TON | $1,855 |
| 25-TON | $3,681 |

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

### DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

**HANNIFIN**

HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

Tried the new, improved SOL-SPEEDI-DRI?

- Your BEST BET for FLOOR PRESERVATION!
- The most DUSTLESS oil and grease absorbent you can buy!

GET A FREE SAMPLE FROM

SPEEDI-DRI CORP.
Menlo Park, New Jersey

Photo courtesy Deluxe Cutter Grinding Company

# Builds profitable business with six COVEL CUTTER AND TOOL GRINDERS

Above: Grinding cutting edge on 6" face mill, at DeLuxe Cutter Grinding Company, using fine wheel to produce smooth finish. Other typical operations include making special tools from standard tools, sharpening face mills, end mills and a wide variety of other tools.

Get full details—send for Bulletin AM-255. Also ask about Covel No. 12A Universal Cutter & Tool Grinder which has Pope Tilting Head with motorized 1 h.p. spindle.

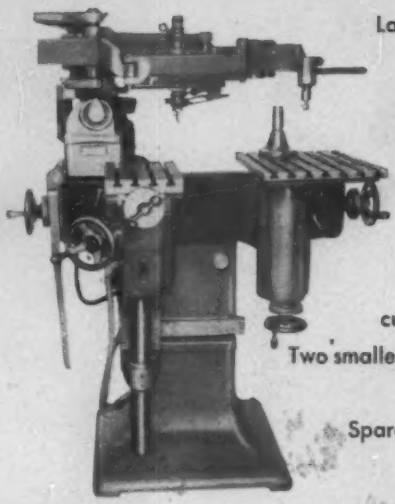
**DELUXE CUTTER GRINDING COMPANY,** DETROIT, has an enviable reputation for service—*fast* service—in the highly competitive business of sharpening and salvaging tools and making special tools—thanks to its Covel Cutter and Tool Grinders. Its first Covel, put into operation eight years ago, proved so fast, accurate and dependable that DeLuxe Cutter Grinding Company now has six Covels busy meeting a constantly growing demand. No major repairs have ever been necessary, no spindles have had to be replaced.

This is another of the many examples of how Covel Cutter and Tool Grinders can improve *your* competitive position, *too*—whether you grind tools for others or for your own use. So, why not standardize on Covels? You'll be money ahead!

**COVEL PRECISION GRINDERS** | **BENTON HARBOR MICHIGAN**

**HYDRAULIC & HAND FEED SURFACE GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS**

## ALEXANDER *DIE-SINKERS*
## for 2 or 3 dimensional work



Latest model, No. 3A for molds and dies up to 1000 lbs. Ratios from 1.5:1 to 10:1, 14 spindle speeds from 475 to 9500 rpm, cutters up to ⅜" dia. Two smaller sizes, 1A and 2A. Prompt delivery. Spare parts are stocked in New York.

Get a close look at Alexander engravers, die-sinkers, and cutter grinders—optical dividing head, centering and cutter grinder microscopes, cylinder roller attachments and other accessories. Write for catalog E on these high-quality, British-made machines.

**J. ARTHUR DEAKIN & SON**
150-28 Hillside Avenue Jamaica 37, New York

... the Quality Line

STEEL Stanho PRODUCTS

## Stainless Steel TAPER PINS

Complete stock, all sizes #7/0 through #14.
Special sizes to order.
Milled or Centerless Ground (Precision Type).
Made to accurate tolerances.

Also "Stanho" Taper Pins made from selected screw stock, Monel, Brass, Aluminum or other metals. Clean bright finish —prompt shipments.

*Write for description and prices.*

JM-6

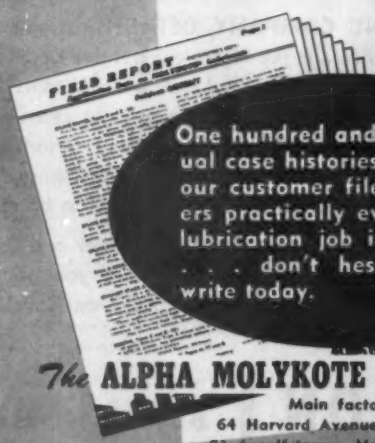
**STANDARD HORSE NAIL CORP.**
Since 1872 NEW BRIGHTON PA

## free! A "MUST" FOR EVERY MACHINE SHOP

**10 pages of FIELD REPORTS on**

## MOLYKOTE® LUBRICANTS

prepared especially for you!




One hundred and thirty actual case histories right from our customer files . . . covers practically every 'tough' lubrication job in the shop . . . don't hesitate . . . write today.

**The ALPHA MOLYKOTE Corporation**
Main factories:
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*Please send me 10 pages of FIELD REPORTS*
Name ..... Title .....
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Tried the new, improved
**SOL-SPEEDI-DRI?**

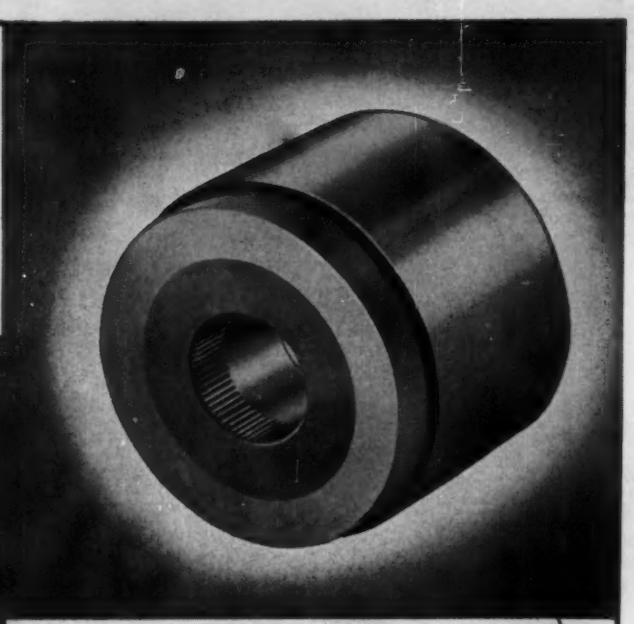
- GREATER ABSORPTION than ever before!
- The most DUSTLESS oil and grease absorbent you can buy!

**GET A FREE SAMPLE FROM**

**SPEEDI-DRI CORP.**
Menlo Park, New Jersey

## SAVES $13,500 IN ONE YEAR*

These plastic molds are made of Huron Steel intricately shaped to very close tolerance. They cost $345 per set and produce 125,000 pieces. Each set is then resized with the Raytheon Impact Grinder at a cost of $75. They may be resized two or three times to provide additional full production runs. Cost saving—$13,500 a year.



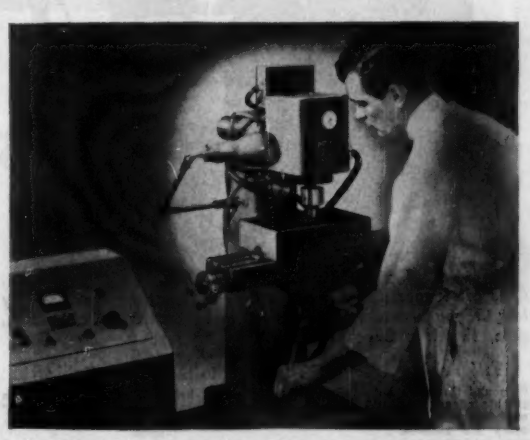
## SAVES $211 ON EACH DIE*

This carbide knurling die is used in the manufacture of fluorescent lamp starters. This die formerly cost $265 each, made by conventional shop methods. By using the Raytheon Impact Grinder for cutting the serrated portion, the cost per die was reduced to $54—a saving of $211 per die.

# CUT YOUR COSTS WITH THE RAYTHEON IMPACT GRINDER

- Machines hardened steel, titanium carbide, tungsten carbide—and many other hard or brittle materials.
- Forms intricate carbide dies without sectioning.
- Cuts to 0.0002"—finishes to 8 microinches.
- No heating of material or distortion of grain structure.
- Requires only a semi-skilled operator.

Perhaps you have a problem which can be solved with the Raytheon Impact Grinder. Write Dept. 6120 and our Application Engineering Service will be happy to assist you. For new catalog, request bulletin No. 2-332, Dept. 6120.



**Raytheon Impact Grinder for Ultrasonic Machining**

*Name of manufacturer and details on request.

**RAYTHEON MANUFACTURING COMPANY**

**Equipment Marketing Division, Waltham 54, Mass.**

RAYTHEON

*Excellence in Electronics*

## Applying Simple, Known Designs—Resulting in Space and Cost Savings

**TRANSFER MACHINE**

**with no roll-over fixtures**

**PART—Intake Manifold,**
**Transferred on the joint face**

**Station 1**—Drill first angular vertical hole at top of manifold.
**Station 2**—Drill second angular vertical hole at top of manifold.
**Station 3**—Idle.
**Station 4**—Transferred into trunnion fixture:

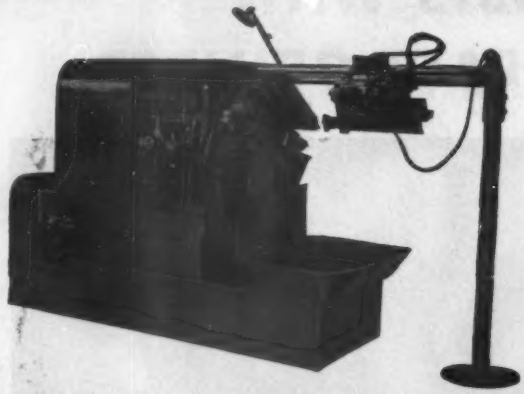
*Front*—drill (2) tapped holes at bottom of manifold.
*Top*—chamfer (2) tapped holes at bottom of manifold.
*Rear*—tap (2) holes at bottom of manifold.
*Bottom*—load, unload and automatic clamp under cover of machining cycle.
*Production*—160 pieces per hour gross.

The above In-Line machine is a standard machine comprised of standard components throughout, arranged to suit the customer's requirements.

*Write for Bulletin No. 54*
*Phone: (Detroit) DUnkirk 2-5300*

**CRESCENT TOOL & MACHINE CO., INC.**
**1780 Southfield Road** **Lincoln Park, Michigan**

## MODERN CUTTING - OFF MACHINE



Cuts off longer pieces than regular automatic machines—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

| ½" Tubing | ¼" Cold Rolled | 1" Tubing |
|---|---|---|
| Cuts and Chamfers both outside edges of ½" .035 wall tubing, 8" lengths, every 2.5 seconds. | Cuts and Chamfers both ends, 20" long, at rate outside edges, pieces 3" of 1 every 20 seconds long. One every 5 seconds. | Cuts and Chamfers both ends, 20" long, at rate outside edges, pieces 3" of 1 every 20 seconds long. One every 5 seconds. |

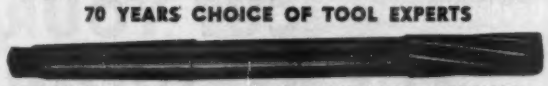
**These popular, time saving machines are now available in four sizes, handling work up to 6¾" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.**

*WRITE FOR ILLUSTRATED CATALOG*

**MODERN MACHINE TOOL CO.**
**2005 LOSEY ST.** **JACKSON, MICHIGAN**

## ATTENTION REAMERS BUYERS

**70 YEARS CHOICE OF TOOL EXPERTS**



REAMERS, MILLING CUTTERS, END MILLS, SPECIALS

**ALVORD-POLK TOOL CO.** **Millersburg, Pa.**

**ENAMELED METAL PRODUCTS**

**CAN BE HOT STAMPED IN COLOR WITH THIS ACROMARK NO. 2AH HOT STAMPING MACHINE WITH DIAL FEED.**

**IT WON'T MARK PORCELAIN ENAMEL THOUGH.**

ACROMARK Company

**7-13 MORRELL ST., ELIZABETH 4, N. J.**

make accurate brinell tests *anywhere* with the

**KING PORTABLE**

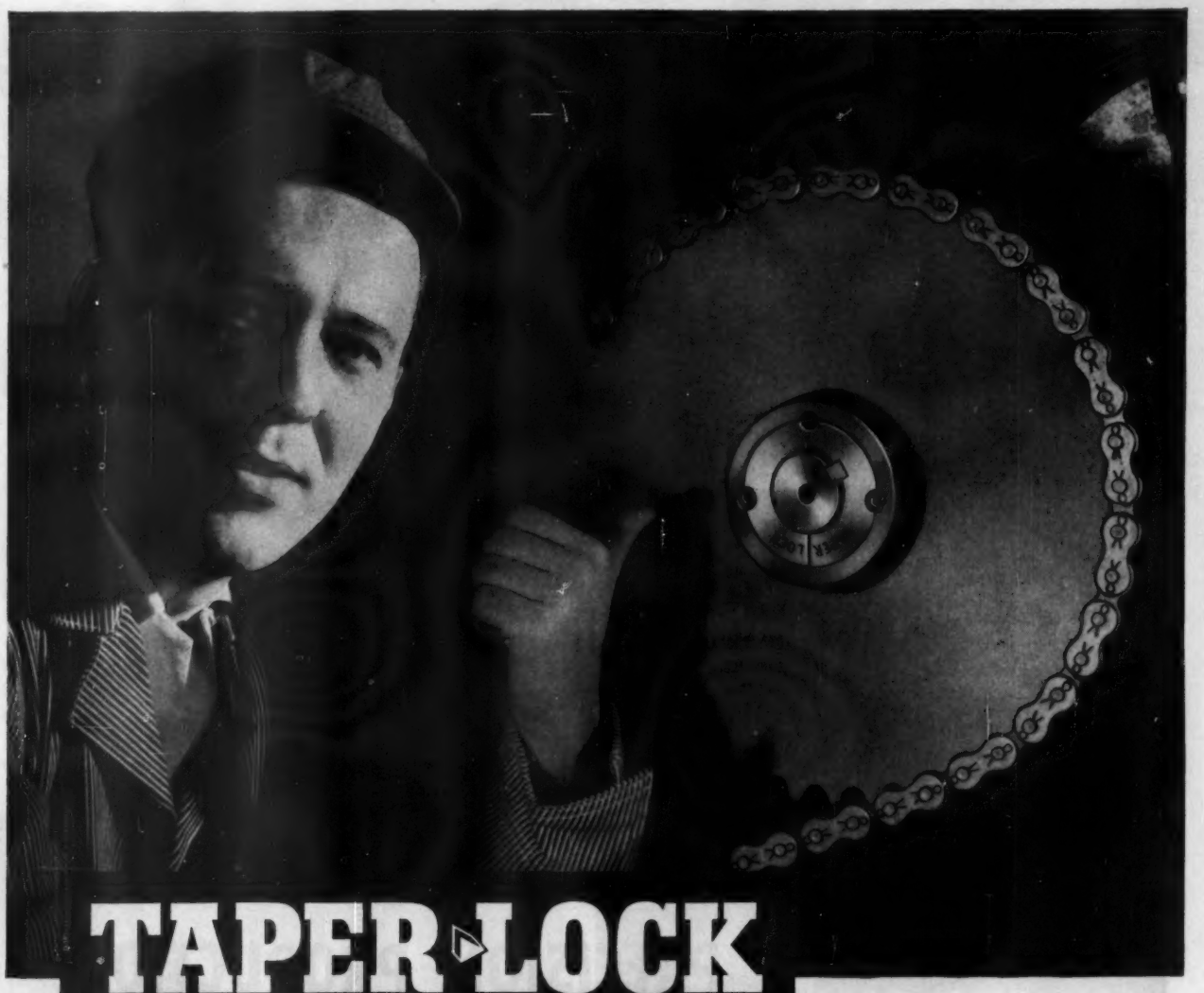
accuracy guaranteed to well within ASTM requirements

THE VERSATILE KING PORTABLE:

- puts a load of 3000 kg on a 10mm ball—other loads as required.
- can be used in any position—even upside down.
- has a removable test head for testing large size parts.
- can get into small, cramped spaces, tubes or cylinders.

**Get full details on how this precision tester will save handling and set up time for you.**

**KING TESTER CORP., 442 N. 13th Street, Philadelphia, Pa.**



# TAPER-LOCK

A PATENTED PRODUCT OF DODGE

## *Holds so tight it will twist a cold-rolled shaft!*

Yes, the Taper-Lock bushing really grips the shaft—holds with the firmness of a shrunk-on fit. It seats evenly along the entire length of the hub. There's no collar, no protruding part, no flange to prevent uniform compression. Having full contact with both hub and shaft, the Taper-Lock bushing holds so tight it would twist a cold rolled shaft before it let go. *Until you want to demount it!* Then a few turns of a hex wrench will release it quickly and completely, without shock to bearings or machinery. For the full story call your Distributor—or write to

**DODGE MANUFACTURING CORPORATION, 100 Union St., Mishawaka, Ind.**

***THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!***

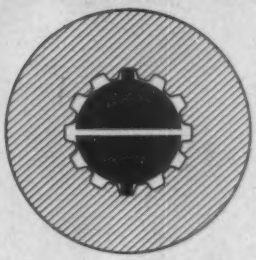
Standardize, economize with Taper-Lock, the bushing that is interchangeable in Dodge sprockets, sheaves, couplings and conveyor pulleys. *More than 2,000,000 in use!*

**CALL THE TRANSMISSIONEER,** your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

**DODGE**

of Mishawaka, Ind.

## FOR GAGING SPLINE ROOTS
**Both Odd and Even Tooth**



With modifications standard Comtorplugs solve many spline gaging needs including pitch diameter or clearance.

*State your problem - - let us help.*

**COMTORPLUG** with interchangeable expanding plugs to gage simple or special bores from ⅛" to 8" dia.

**UNIQUE ADVANTAGES**

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging—automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable—no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, guided missile, farm machinery, automotive transmission, household appliance, and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

**COMTOR COMPANY**
68 Farwell St.
WALTHAM 54, MASS.

***GET THE FULL FACTS—REQUEST BULLETIN 48***

## KEYSEATING
### The Modern Way

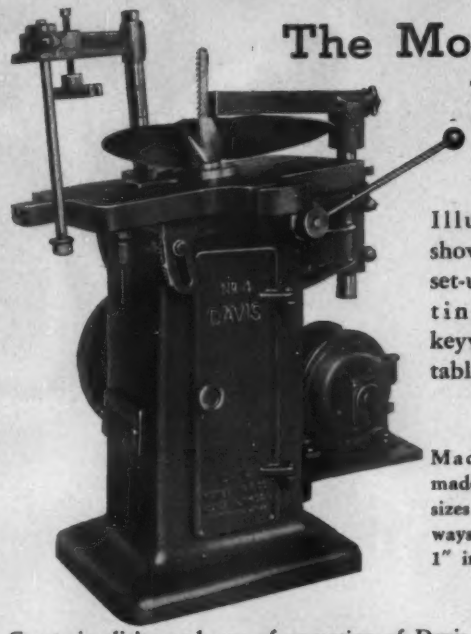


Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.
*Let our engineer study your keyseating problems.*

**DAVIS KEYSEATER COMPANY**
**403 EXCHANGE ST. ROCHESTER, N. Y.**

It adds up . . .
The new, improved
**SOL-SPEEDI-DRI**

- UNMATCHED for low, annual USE-COST!
- The most DUSTLESS oil and grease absorbent you can buy!

**GET A FREE SAMPLE FROM**

SPEEDI-DRI CORP.
Menlo Park, New Jersey

## PRECISION PRODUCTION at GRAFLEX

At Graflex, Inc., in Rochester, N.Y., operators inspect their own work and get paid for it, and foremen have full freedom of action. These are just two important characteristics of the organization of the camera and precision-equipment manufacturer bearing this familiar name.

This *American Machinist* Special Report by Executive Editor E. J. Tangerman describes production methods at Graflex in detail. Over fifty photographs and other illustrations add to the value of the twenty-page report.
*20 pages — — — 25 cents per copy*

***Reader Service Department***

**American Machinist**

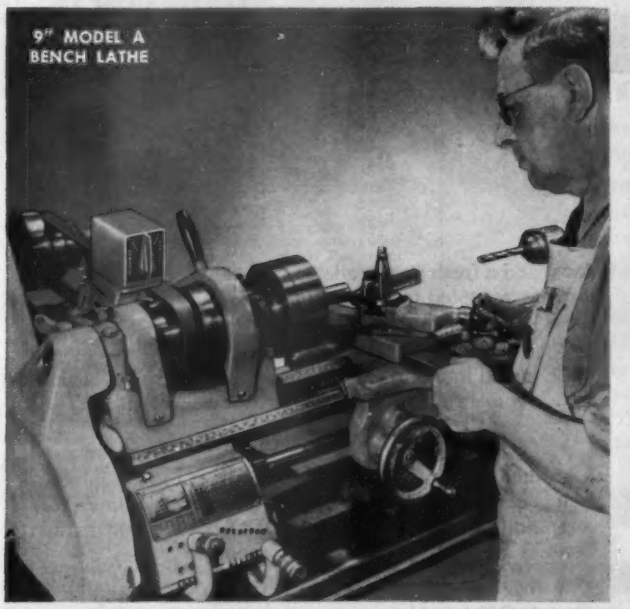
**McGraw-Hill Building New York 36, N. Y.**

# THE TURNING POINT FOR LOWER COSTS

Your turning point for lower machining costs can readily be found in South Bend 9" Lathes. If you have small work requiring close tolerances you will find these lathes capable of handling it efficiently. Additional savings will also be made in original investment, power, tooling, maintenance and floor space. And their simple, easy operation is economical of operator effort.

You'll be surprised how busy you'll keep them day after day. Their versatility permits a wide range of operations on a large variety of jobs. And this adaptability involves only a minimum of down time and effort. An exceedingly large selection of practical attachments and tools is available to simplify tooling for both routine production and special operations.

There is a South Bend 9" Lathe for virtually every production, toolroom and maintenance need. They are made in Quick Change Gear, Toolroom, and Independent Change Gear models in both bench and floor types. Let your near-by South Bend distributor show you how these precision lathes can do you a "good turn." Or, send coupon for literature.

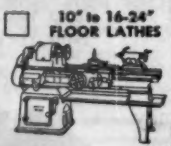


Compared with our costs
**OUR PRICES ARE LOWER**
than they were back in 1941

Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

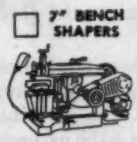
PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES

☐ DRILL PRESSES



☐ 7" BENCH SHAPERS

☐ TOOL GRINDERS

☐ ½" & 1" Collet TURRET LATHES

Name _____ Company _____

Street _____ City & State _____

*Building Better Tools Since 1906* • **SOUTH BEND LATHE** • South Bend 22, Indiana

# America has homework to do!

THERE'S PROBABLY a lot about your town that makes you want to brag a bit about it.

But there's one thing you *can't* be proud of. And it's a shame you share with just about every other community in America.

The homes where far too many people live are a disgrace. Slums, semi-slums, housing blight are with you. Fixing them up is the homework to be done.

If your town is like most in the U. S., here's what the figures show: 1 out of every 10 homes are rock-bottom slums. Nearly one-half urgently need basic repairs.

But slums are something that is happening on the other side of town, you may say. The problem isn't mine.

### Slums are YOUR homework

Distance is no barrier against the threat and cost of housing blight.

Your taxes go up because it takes more money for your town to fight the diseases and delinquency and poverty spawned in the slums. The security of your family goes down because the slum is the natural parent of crime.

### Where your business comes in

Every firm has a responsibility toward the town where it's located. Part of it is to support community improvements as any other good citizen would.

Some slums are beyond repair. They must be torn down and a fresh start made. Others can be made to conform to accepted living standards. So it is up to you to get behind every sound program which seeks to provide adequate housing for all our people.

Civic and individual groups must have business backing . . . *your* firm's backing if they are to succeed.

### Follow the course of Action!

A group of Americans from every walk of life has joined together in a non-profit organization to combat home and community deterioration, A.C.T.I.O.N., the American Council To Improve Our Neighborhoods.

**Send today for a free copy of "ACTION."** It explains what A.C.T.I.O.N. is and proposes to do. It lists booklets, research, check-lists, and other material which can help you. Address P. O. Box 500, Radio City Station, New York 20, N. Y.

**ACTION**

**American Council To Improve Our Neighborhoods**

# CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

## EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

**UNDISPLAYED RATE**

**(Not Available for Equipment Advertising.) $1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.**

**POSITION WANTED undisplayed rate is one-half of above, payable in advance. BOX NUMBERS count 1 line additional.**

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**DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).**

**AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns —30 inches to a page. A.M.**

**DISPLAYED RATE**

**The advertising rate is $12.60 per inch for all Business Opportunities & Equipment advertising appearing on other than a contract basis. Contract rates quoted on request. Effective Jan. 1956 the rate will be $14.50 per inch.**

**EMPLOYMENT OPPORTUNITIES. $16.65 per inch, subject to agency commission. Effective Jan. 1956, rate will be $19.30 per inch.**

*NEW ADVERTISEMENTS Address N.Y. Office, 330 W. 42 St., N.Y. for December 19th issue closing December 5th*


**WANTED PRODUCTION SUPERVISOR**

**Exceptional opportunity for permanent position responsible DIRECTLY TO THE PRESIDENT for man under 40 with good education and experience in mass production especially of medium sized forgings, hardening and finishing, and to set up and operate production control and cost in modern progressing plant with friendly atmosphere. Apply in confidence with full information to:**

***Ernest Estwing***

**ESTWING MFG. CO.**

**ROCKFORD, ILLINOIS**


REPLIES (Box No.) Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

### POSITION VACANT

**General Foreman for machine shop and structural** shop employing approximately 120 men. Must have thorough knowledge of up to date tools and manufacture of heavy machine structures. P-8412, American Machinist.

### SELLING OPPORTUNITY OFFERED

**Manufacturer of Horizontal Boring Mills of table,** floor, planer and portable types with spindle diameters 3" to 5", has exclusive territories available throughout the country for well established machine tool dealers. Please state qualifications in first letter. Scharmann Machine Corporation, 337 Blvd. of Allies, Pittsburgh 22, Pa.

### EMPLOYMENT SERVICE

**Salaried Positions, $5,000 to $35,000. We offer** the original personal employment service (established 45 years.) Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

### POSITION WANTED

**Sales engineer — extensive sales and mechanical** experience in machine tool field, graduate ME, desires to relocate to more responsible position. PW-8480, American Machinist.

### SELLING OPPORTUNITIES WANTED

**Well established Cleveland firm of sales engi**neers, operating throughout northern Ohio, presently representing four nationally known machine tool manufacturers exclusively, open for one additional account. We offer considerable experience, versatility, and competence in sales engineering, with thorough knowledge and coverage of territory. Interested only in American quality line backed by good engineering and manufacturing facilities. Write RA-7934, American Machinist.


**WANTED: PRODUCTION ENGINEERS**

The increasing complexity of products in Honeywell's expanding Aeronautical Controls Division has created several openings for experienced Production Engineers.

**REQUIREMENTS**

A broad engineering knowledge equivalent to B.M.E. or B.E.E. Degree, plus 5 years Production Engineering experience. Experience should have included major responsibility for process planning on new products, such as precision mechanical, electrical, or hydraulic equipment, electro-mechanical controls, servo-mechanisms, electric motors, instruments, or gyros. Thorough knowledge of tooling, estimating, metals fabrication, manufacturing, and assembly operations.

**CONSIDER THESE ADVANTAGES:**

Ideal suburban living in friendly, uncrowded Minneapolis, famous for its cultural activities, recreational facilities.

***Generous employee benefits*** include broad company-paid insurance and pension plans, liberal tuition allowances for advanced study.

***Travel and family moving expenses paid.***

*Please send résumé of your background including salary requirements, to:*

J. A. HILL
Engineering Placement Manager
Minneapolis-Honeywell Regulator Company
2753 4th Avenue South
Minneapolis 8, Minnesota

MINNEAPOLIS **Honeywell** *First in Controls*

NEW 2nd PRINTING
**MACHINE TOOL RECONDITIONING & the Art of Hand Scraping**
*Write for folder describing illustrated book*
**MACHINE TOOL PUBLICATIONS**
**215 Commerce Bldg., Fourth & Wabash Sts. St. Paul 1, Minn.**

**PEACOCK CORPORATION**
**Propane Gas Installations**
**and**
**Anhydrous Ammonia Plants**
**Paul E. Peacock, Jr., Pres.**
**Box 268 Westfield, N. J. Westfield 2-6258**

**WANTED TO MERGE**

**Profitable corporation wishes to merge into a corporation with a tax loss carry-forward of $500,000 or more. Replies held in strictest confidence.**

**BO-8355, AMERICAN MACHINIST**
**330 W. 42 St., New York 36, N.Y.**

SEARCHLIGHT SECTION

# AMERICA'S LARGEST STOCK
## NEW-USED-REBUILT MACHINE TOOLS

**BORING MILLS — Horizontal JIG BORERS**

DEFIANCE Model 25-A Boring Mill 3¾" bar; late
EX-CELL-O #112-C Single End Double Spindle; late
EX-CELL-O No. 2112 single end, double spindle; late
GIDDINGS & LEWIS 340-T; 4" bar; late type
HEALD No. 47-A single end Bore-matic; late
HEALD No. 49 double end Bore-Matic; latest
LANDIS No. 35, 3½" Floor Type, motor drive
NILES 8" bar; floor type; motor drive
SELLERS 5" bar Table Type; late type

**BORING MILLS—Vertical**

BULLARD 8', 8-spindle Type "D" Mult-au-matic
BULLARD, 18", 6-spdl. Type "D" Mult-au-matic; late
BULLARD 36" high speed 18" extra high column
BULLARD 36", vertical turret spiral drive, late
NILES 36-44" Vertical Turret Lathe; late type
NILES 100" Heavy Duty Vertical; PRT, late
SELLERS 144", 2-swivel heads on cross rail; power rapid traverse, motor drive

**GRINDERS—Cylindrical, Plain and Universal**

BROWN & SHARPE No. 1 Universal; 10"x20" late
BROWN & SHARPE No. 2; Univ.; late
BROWN & SHARPE No. 4 Universal 14"x60"; late
CINCINNATI 14"x72"; Universal; Model ER; late
HARTEX 16"x60" Univ., model RHU-1520; New 1953
LANDIS 4"x12" Type "H" Hyd., Plain; late
LANDIS 10"x18" type "C" Plain; hydraulic
LANDIS 10"x36" Plain; motor drive
LANDIS 10"x36" type DC pl. hyd., infeed; m.d., late
LANDIS 16"x36" Type "C" Universal; late
LANDIS 20"x144" Plain Cylindrical Gap; M.D.
LANDIS "D" 25"x72" Crank Pin Grinder; late
LANDIS "C" 18"x72" Plain; late type
LANDIS type "DCP" 10"x72" hydr., late type
NORTON 4"x12" model CTU Plain; new 1953
NORTON 6"x18" Type "C" Plain Cyl.; late
NORTON 10"x36" Plain; motor drive
NORTON 10"x48" Type "C" Hydr., Plain, Cyl.
NORTON 6/10"x18" Plain, Cylindrical; late
NORTON 16/26"x72" Plain, Cylindrical; late

**LATHES—Engine and Mfg.**

BRIDGEFORD 48"x10' Geared Head Lathe
GISHOLT No. 12 Hydraulic Automatic Chucker; late
HENDEY 16/24"x30" centers; Timken; late
HENDEY 24"x36" centers, M.D.; late type
JONES & LAMSON "FAY" 8" Auto. Timken; late
JONES & LAMSON "Fay" 20"x25" Auto., M.D.
LeBLOND Model 7ACL Crankshaft; 9"x30"; M.D.
LeBLOND 20"x48" centers; H.D. Timken; late
LeBLOND 27"x144" centers; motor drive
LODGE & SHIPLEY No. 3-A Duomatic; late
LODGE & SHIPLEY No. 5, 24" & 96" centers; DUOMATIC; Timken; late
LODGE & SHIPLEY 12"x30" G.H. Toolroom; late
LODGE & SHIPLEY 14"x30" Centers; late type
LODGE & SHIPLEY 16/20"x54", 18/22"x54" Toolroom; Timken; late
LODGE & SHIPLEY 18"x30", 18"x54"; Timken; latest
LODGE & SHIPLEY 20"x48", 20"x144"; Timken; late
LODGE & SHIPLEY 20"x54" Gap; Timken; late
LODGE & SHIPLEY 22"x48", 22"x96"; Eng., Timken
LODGE & SHIPLEY 24"x48"; Timken; latest
LODGE & SHIPLEY 24"x96"; Timken; late type
LoSWING 4"x60", 4"x84", 6"x108" centers, late type
MONARCH 18"x48" Model CBB; late type
MONARCH 14"x54" centers; model AA; late
MONARCH 22"x264", 22"x336" cc. Model M; late type
MONARCH 12"x30" model "KK" Eng., Timken; late
MONARCH 24"x60" model "M", Timken; late
MONARCH 24/36"x48" model "N", air tracer; 60 series; late type
MONARCH 16"x30" model "C", Timken; late type
MONARCH; 16"x48" "CBB" (raises to 26½"); Timken; late type
MONARCH 18"x72" "BB" (raises to 26"); Timk.; late
NEW HAVEN 42"x120" centers geared; M.D.
NILES 30"x25', 30"x48' bed, Sgle. End Bor., "Timken"
NILES 30"x108" centers "Time Saver"; Timken
NILES 36"x100" c.c. "Time Saver"; late type
NILES 42"x216" centers Geared Head; late
PRATT & WHITNEY 16"x30" c.c.; Timken; late
SPRINGFIELD 14"x43" geared; M.D., late type
SPRINGFIELD 20"x48" centers, Timken; late
SUNDSTRAND 8"x15" Auto mfg., late type
SUNDSTRAND 10"x60" centers, Automatic; late
SUNDSTRAND 12"x22" Automatic; late type

**LATHES, Turret**

GISHOLT 1L, 2L Univ. Saddel type; Timken; late
LIBBY 1H6, 6" hole, long bed; late
LIBBY 4H-12" hole, M.D. Turret Lathe; M.D.
MAGDEBURG model MWF-250 Universal; late
MOREY No. 2 ram type, Timken; latest type
MOREY No. 4 ram type; Full Univ.; latest
POTTER & JOHNSTON No. 4D Auto. H.S., Timken; late
POTTER & JOHNSTON No. 4D-5 model "FC"; No. 4D-6 H.S.
POTTER & JOHNSTON No. 8DT Automatic Chucking & turning; late type
WARNER & SWASEY #1 "Electric", M.D., late
WARNER & SWASEY No. 2 Ram type; Timken; late
WARNER & SWASEY #1A; 3, 4, 4-A; Univ. Ram Type; late
WARNER & SWASEY No. 4, No. 5, Univ., preselector head, late

**MILLERS, Profile and DUPLICATING MACHINES**

CINCINNATI 5-80 hydr., tracer control; late
PRATT & WHITNEY 30", 2-spindle; late type
PRATT & WHITNEY "Keller" model GG 1210; latest

**PLANERS**

GRAY 48"x48"x10' "Maximum Service"; 4 heads; Power Rapid Traverse; D.C. Reversing; M.D.
LIBERTY 144"x78"x48' adj. openside; box table; 4 hds.; vari-voltage; Power Rapid Traverse; M.D., late type; NEW 1940
NILES 48"x48"x10' double, 4 heads, PRT; M.D.
NILES BEMENT POND 72"x72"x30'; 4 hds.; Power Rapid Traverse; D.C.; M.D.
POND 60"x60"x14' double housing; late type
SOUTHWARK No. 1, 16' Plate Edge Planer; late

**PRESSES**

BESCO Model M18; OBI; cap. 10 tons; New
BESCO Model EB2, 10½-ton Back Flywheel; New
BESCO Model EB4, 40-ton cap. Back flywheel; New
BIRDSBORO 325-ton, 31"x31" bet. uprights, hydr.
BLISS No. 410A, 525-ton double action toggle drawing press; M.D.
METALWOOD No. 35A Univ. Arbor & Forcing Press
NATIONAL No. 5 "Maxi-Press" 1,000 ton cap., H.S. Forging Machine; M.D.
NIAGARA No. 66E, 35-ton Press; late type
ROGERS 150 ton Shop Press; latest type
V & O 30-ton O.B.I. Press; late type
WATERBURY FARRELL No. 9, 125-ton cap. Blanking Press; M.D.
WATSON STILLMAN 150-ton Horiz. Hydr. hand operated Wheel Press

*PARTIAL LIST. Ask for catalog!

FREE PARKING for CUSTOMERS on PREMISES

**MOREY MACHINERY CO. INC.**
MANUFACTURERS • MERCHANTS • DISTRIBUTORS of MACHINE TOOLS
387 LAFAYETTE ST. NEW YORK 3, N.Y.

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# WANTED TO BUY

Plant equipped with Tube Mill for manufacturing 2"-3" square tubing.

BO-8473

**American Machinist**
**520 No. Michigan Ave.**
**Chicago 11, Ill.**

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## FOR SALE BY OWNER
## MACHINE SHOP EQUIPMENT

**PARTIAL LIST**

Douglas miller; Barnes drill; Niagara roller, shear, groover; Peck Stow Wilcox cutter; Chicago & Ohl brakes; Dalton lathe; Oliver band saw; Kelly compactor power float; Jenny; Schramm & Curtiss compressors; Pumps, hydraulic lifts, grease guns, radial drill, grinders, drill press, portable crane, blacksmith drop hammer, chain blocks, Van Dorn electric shear and other items.

For details write—Phone Main 4-3400

**V. MACK**
NEW YORK DOCK CO., BKLYN 1, N. Y.
SUBJECT TO PRIOR SALE

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**THREADED Rods**

10 to 12 ft. lengths
ALL METALS
Also Screw Machine Products to Order
**EASTERN**
Makers of H & G Die Heads
Machine Screw Corp.
20-40 Barclay St.
New Haven, Conn.

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**Large Machine and Weldment Capacity**

Open capacity on 24 ft. and 10 ft. Vertical Boring Mills 7", 5" and 4" Horizontal Boring Mills; large radials and supporting small machines including new 2 AC Warner & Swasey automatic chucking. Especially interested in producing weldments requiring machining.

C. H. WHEELER MANUFACTURING CO.
Sedgley Ave. at 19th & Lehigh, Philadelphia 32, Pa.
Phone: Henry Kingston—Sagamore 2-5000

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**HB MACHINE TOOLS**
NEW - USED REBUILT MACHINERY

*Serving the World's Largest Manufacturers*

#45—9" Giddings & Lewis Horizontal Table Type Boring Mill Serial #1815!
42" Vertical Bullard Serial #9708
(2) 13" Peerless Power Hack Saws
#72A3 Heald Sizematic Internal Grinder Serial #12276
Sidney Cone Head Lathe Serial #3306. swing 36" bed 32'.

**HAZARD BROWNELL MACHINE TOOLS INC.**
350 WATERMAN STREET PROVIDENCE 6, R. I. DEXTER 1-8880

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**PATTERNS in WOOD and METAL**
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

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**MACHINERY WANTED**
**Thread Grinder**

Jones & Lamson late type thread grinder, 12" capacity, 36" centers, no more than five years old. Give Serial No., year built and asking price.

W-8228, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

---

**WANT TO BUY**

Four two Jaw Air or Hydraulic Chucks for National Acme 4⅝" Chucking Machine. Can use any two jaw power operated chucks not more than 4¾" OD with two piece jaws.

ROBY MACHINE WORKS, Truro, Iowa

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***SPECIAL SERVICE***

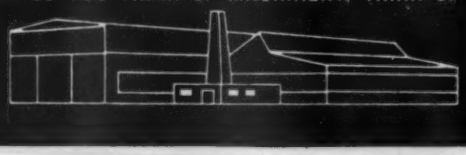
**Time Study Equipment Time Study Boards with** UCEZ transparent watch holders. Stop-watches —Pedometers—Slide rules, counters etc. Time study forms in stock. Write for free sample kit. O. P. Co., 5544 S. Homan, Chicago 29, Ill.

# EXCELLENT LATE MODEL
# USED AND REBUILT MACHINE TOOLS

2⅜" 6 spdl Acme Gridley automatic, 1941
12" x 46" Sundstrand type B auto lathes (2) 1947
7" No. 76H Baird automatic chucker, 1942.
36" and 42" Bullard vertical turret lathes.
No. 5-42 Cincinnati vert. duplex broach, 1946.
10 ton 36" Stroke American 10-T-36 Broach, 1949.
12" x 72" Colonial Broach grinder, late.
5" x 36" Colonial Broach grinder, late.
25" Cleerman round col. upright drill, late type.
9' arm 16" Col. American motor-on-arm radial drill.
No. 2 Cincinnati centerless grinder, Filmatic bearings, ser. 2M2H2F21.
4" x 18" Cincinnati pl. hyd. cylindrical grinder, 1946.
6" x 18" Landis "C", 30° head cylindrical grinder, 1941.
6" x 30" Cincinnati "EA" Filmatic plunge cut cyl. grinder "2" 1942-43.
No. 72A Heald hyd. sizematic internal grinder, 1945.
13" x 60" Model 300 Hanchett vert. spdl. surface grinder, late.
9" x 18" Hendey tool & gage-maker's lathe, 1940.
14" x 46" Hendey toolroom lathe, 1940.
20" x 67" cc Axelson H.D. engine lathe, late.
26" x 10' bed LeBlond Heavy Duty G. H. engine lathe.
18"/38" x 6' bed Nebel sliding bed extension gap lathe, timken bearings, new 1941.
15" x 30" Lipe Carbomatic hydraulic lathe, new 1942.
17" x 5' bed LeBlond Rapid Production lathe, 1946.
No. 3H Kearney & Trecker plain milling machine, new 1942.
No. 2-18 Cincinnati mfg mill, new 1940
No. 2-20 Kent Owens hydraulic mfg. mill, (2) 1942.
Model M24 Kearney & Trecker Mfg. mill, 1943.
36" Rockford openside hydraulic shaper—planer
48" x 48" x 10' Gray Maxi-Service planer. P.R.T.
2 Thru 70 Ton Knee type punch presses (dozens).
3 Thru 43 ton Open Back Inclinable presses
160 Ton No. 12-E Cleveland straight side press.
126 Ton No. 306 Bliss straight side press.
260 Ton No. 795½—72 Toledo D.C. toggle press.
500 Ton No. 1039 Hamilton D.C. press, 60 x 102 BA
545 Ton No. H3612½ Hamilton straight side press.
100 Ton No. 92½ C Toledo S.S.D.C. Press
12" Hendey universal shaper, F.M.D.
8' x 10 ga Bliss power squaring shear

**PARTIAL LISTING—SEND FOR CATALOG OF 1000 MACHINE TOOLS**

WHEN YOU THINK OF MACHINERY, THINK OF



# MILES
MACHINERY COMPANY

2039 E. GENESEE AVE. PHONE 2-3105 SAGINAW 1, MICH.

# McDONALD
## USED MACHINERY

Niagara 6' 16-Ga. and 6' 14-Ga. Power Shears.
Lambert 4" Bar Table Type Horiz. Boring Mill
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 5 Rect. Overarm Grd. Hd. Plain Horiz. Miller.
N-B-P 600 Ton Horiz. Hydr. Wheel Press, M.D.
Baush 44" Vert. Boring Mill 2 heads
Knight #40 Vert. Jig Borer
American 20"x8' Grd. Hd. Lathe motor in base
Landis 20"x72" and 18"x60" Plain Ext. Grinder
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W & E No. 2-A Grd. Hd. Univ. Turret Lathe shucking
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond Q.C.G. Ext. Bed Gap Lathe 19"/40" swing by 11'9"/17' centers
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 24" chuck.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rct. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed Q.C.G. Lathe 1939.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kompsmith No. 2 Vertical Maximiller M.D.
Springfield Planer Type Surf. Grinder.
P & J #2 Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box Col. Drill
Cincinnati #3 & #4 Centerless Grinders
Bullard 24" Vert. Turret Lathe.
Lynd-Farquhar 29" stroke open-side Shaper Planer.

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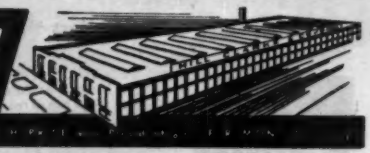
## MACHINERY COMPANY



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6"-8 spdl. Goss & deLeeuw Chucker

### BORING MILLS
100" Niles Vertical Boring Mill
Foote-Burt Vert., 5" dia. spdl., 30" sw. (1941)

### BORING MACHINES
No. 49 Heald Borematics (1942)

### DRILLS
1 spdl-14" sw. No. 2 Avey Cam Feed (1942)
1 spdl-24" sw. No. 2MA-6 Avey, pow. fd.
1 spdl-26" sw. No. 4 MS Leland-Gifford (hyd.)
2 spdl-24" sw. No. 3 Avey
3 spdl-24" sw. No. 2MS Allen, Tap & B.G. (1942)
4 spdl-14" sw. No. 2LMS L-G
4 spdl-26" sw. No. 2LMS L-G back gears
6 spdl-26" sw. No. 2LMS L-G Tap & B.G.
16 spdl-K60H Fox Multiple, (1944)

### GEAR MACHINES
11" Gleason Gear Generator
No. 36HM Gould & Eberhardt
No. 615A Fellows Gear Shaper
No. 612A Fellows Gear Shaper
No. 6S Fellows, Cone Drive
No. 12HS Gould & Eberhardt

### GRINDERS
No. 4H, 4"x12" Landis Pl. Cyl.
5"x30" Norton Cam-O-Matic (1946)
5"x42" Norton Type C Cam-O-Matic (1944)
6"x18" Norton Type C Plain (1942)
16"x18" Norton Type C (1941)
10"x36" Norton Type C Plain
10"x36" Norton Type C Cam Grinder
10"x48" Norton Type C Plain (1943)
14"x48" Landis Type C Plain
14"x48" Landis Universal
18"x36" Cincinnati Model ER Univ. (1942)
18"-36"x72" Norton Plain
18"x120" Norton Type A Plain
20"x96" Norton Plain
20"x32"x144" Norton Gap
20"x192" Norton Type A Plain
24"x264" Norton Type A Plain
42"x72" Norton Pl. (1947)
Hill-Clarke Cylindrical Norton Type M.D.

| | |
|---|---|
| 10"x30" centers | 14"x50" centers |
| 10"x72" centers | 14"x72" centers |
| 10"x96" centers | 18"x96" centers |
| 14"x36" centers | 22"x96" centers |

No. TG618 J. & L. Thread Grinder
No. 81 Heald Internal Centerless
No. 74 Heald Internal Centerless
No. 72A3 Heald Univ. Internal
No. 72A5 Heald Internal (1942)
No. 72A5 Heald Bridge Type Int.
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16A16 Bryant
No. 16-28 Bryant Internal
No. 16A28 Bryant Internal
No. 16F28 Bryant Internal
No. 16-36 Bryant Internal
No. 24-36 Bryant Internal
No. 24-36 Bryant Internal
No. 24L36 Bryant Internal
8" Arter Rot. Surf.
No. B34, 36" Chuck Arter Surface
No. 8 Hanchett Double End Disc
No. 214 Besly Double End Disc

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12"x21" Fay Automatic
16"x21" Fay Automatic (1944)
16"x32" R-14 Seneca Falls
16 ML 16 LeBlond Semi-Automatic
14"x36" cc Amer. Grd. Hd., M.D.
27"x84" cc Amer. Grd. Hd., M.D.
36"x126" cc Putnam Grd. Hd., M.D.
No. 2 W. & S. Geared Head
No. 5W Acme Universal
No. 7A Jones & Lamson (1942)
No. 1A Warner & Swasey
No. 2A Warner & Swasey
No. 3AL Gisholt Cross Slide Tur.
No. 3H-10 Libby International
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)
No. 4FU Fastermatics, Tur. Type

### MILLING MACHINES
No. 36 Van Norman Pl., Swivel Hd. (1941)
No. 4 Cincinnati Dial Type Pl. (1942)
118 Van Norman Hyd. Mfg. (1942)
No. 66 Cincinnati Vertical (1942)
Briggs Mfg. Mill, 30"x8" Table M.D. (1942)
54"x30"x16' Ingersoll Slab
10"x60" Pratt & Whitney Thread Model CT Lees-Bradner, 13" spdl. hole (1942)

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60"x48"x27' American, 4 Heads
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No. 5A Kaufman Pneumatic Tapper
16" G&E Ind. Shaper
15"x18" Dill Slotters
Model 200 Micromatic Horiz. Hone
No. 224 Barnes Vert. Hone, 4" Cap.
No. 306 Barnes Vert. Hone, 8" Cap.
15 Ton American Hyd. Press
42"-16 ga. Economy Shear, M.D.

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**No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head.**

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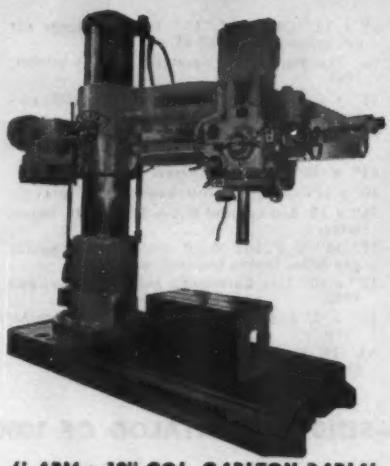
**15'x10'x36' BETTS double housing Planer, 4 swivel heads tendant control box table Motor Driven.**



***6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943***

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**No. 18 MARVEL Hydraulic Roll Stroke Power Hack Saw, 18" x 18" cap., M.D.**

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**400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.**

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**No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.**

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4" & 3½" Bar Landis, Floor Type (2)
3¾" bar Defiance, Tbls. Type, Late
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Nos. 2B Reid, 3B Abrasive, Surf.
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14"-18½"x78" Gen. Monarch, T.A.
TURRET, Nos. 2 & 3 Morey—2, 3 W. & S.
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No. 3 Baush, 20x40" head, m.d.
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4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper
No. 924 Barnes Vertical Drilling, Boring, Facing & Reaming Machine
6 spindle W.F. & John Barnes Vertical Drilling Machine, m.d.
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20" Cincinnati Bickford Super-Service Prod. Drill, m.d.
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24" Cincinnati-Bickford, m.d.
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No. 315 Baker Heavy Duty, s.p.d.
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No. 712 Fellows, m.d.
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#5 BRYANT Internal Hydraulic Hole Grinder
#16-16 BRYANT Hydraulic Internal Hole Grinder
#16-36 BRYANT Internal Hydraulic Hole Grinder
#24—P-26 BRYANT Hydraulic Internal Hole Grinder
#50 HEALD Internal Grinder
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6"x18" CINCINNATI Plain Cylindrical Grinder
10"x18" NORTON Semi-Automatic Plain Cylindrical Grinder
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14"x72" BC Plain CINCINNATI Self Contained Grinder
16"x36" NORTON Type C Cylindrical Grinder
16"x72" NORTON Type C Plain Cylindrical Grinder
Model A3-16 ARTER Rotary Surface Grinder
Model 25A HEALD Rotary Surface Grinder
#16A2 BLANCHARD Automatic Surface Grinder
Model 76 RAP ROGERS Knife Grinder

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18"x8' LODGE & SHIPLEY Type A Engine Lathe
18"x144" BC LODGE & SHIPLEY Engine Lathe

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#2A WARNER & SWASEY Geared Head Way Type Turret Lathe
#2L GISHOLT Geared Head Way Type Turret Lathe
#7A—2½ JONES & LAMSON Geared Head Way Type Turret Lathe
#3A WARNER & SWASEY Geared Head Way Type Turret Lathe
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### MISCELLANEOUS

5'13" AMERICAN Hole Wizard Radial Drill
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8'19" CINCINNATI BICKFORD Super Service Radial Drill
#61A FELLOWS Gear Shaper
#36BM GOULD & EBERHARDT 3 Spindle Bevel Gear Cutter
#725 FELLOWS High Speed Gear Shaper
#12 GLEASON Straight Bevel Gear Rougher
#60 SM GOULD & EBERHARDT 3 Spindle Vertical Gear Cutter
Model "A" BARBER COLEMAN Hobber

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Cinn. 6" x 30" Model EA Grinder.
Jarecki BB Screw Press, 80 tons, 1948.

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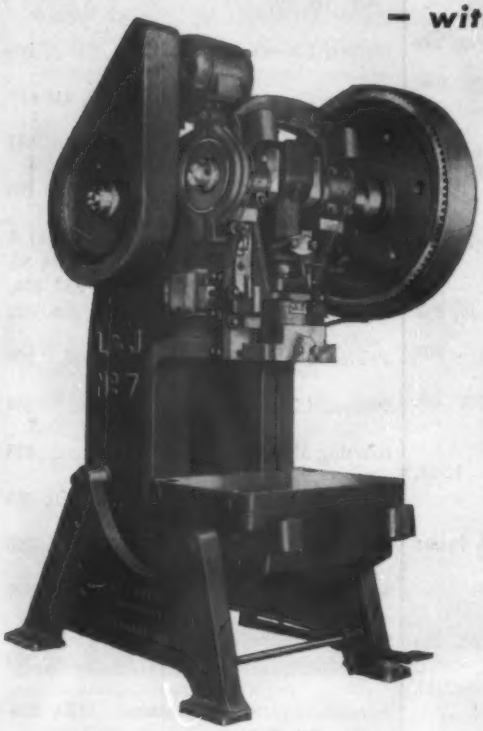

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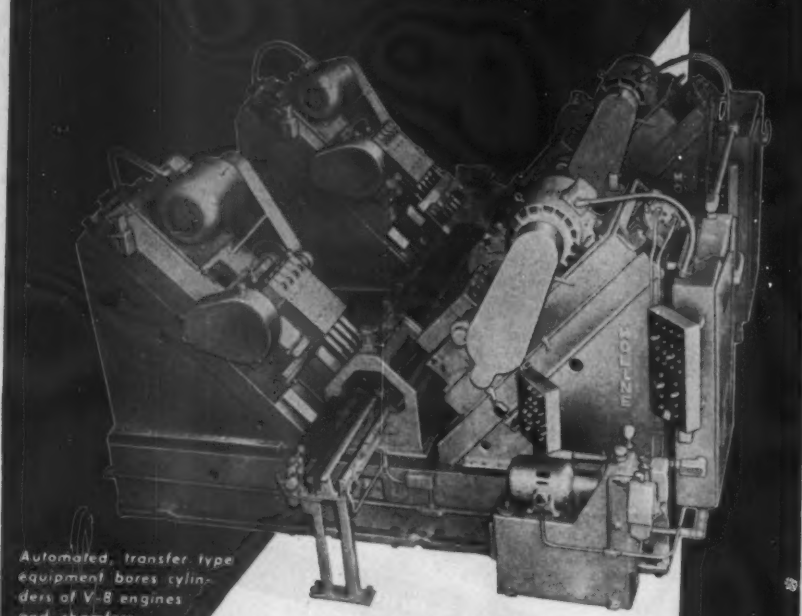

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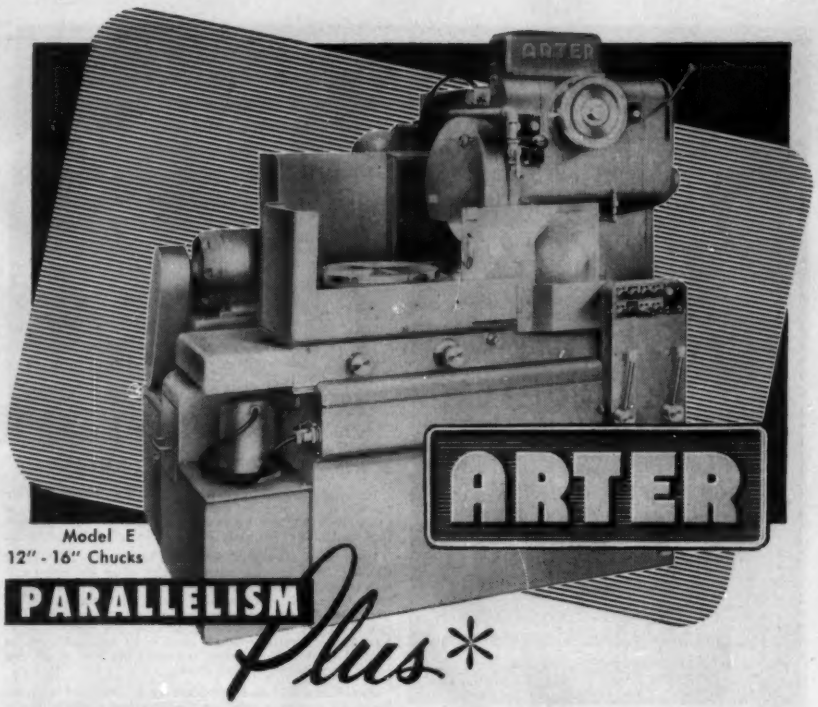


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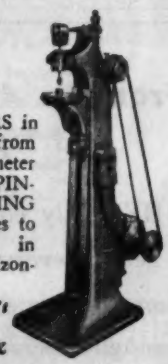

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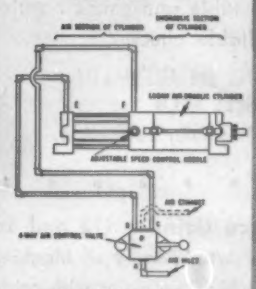

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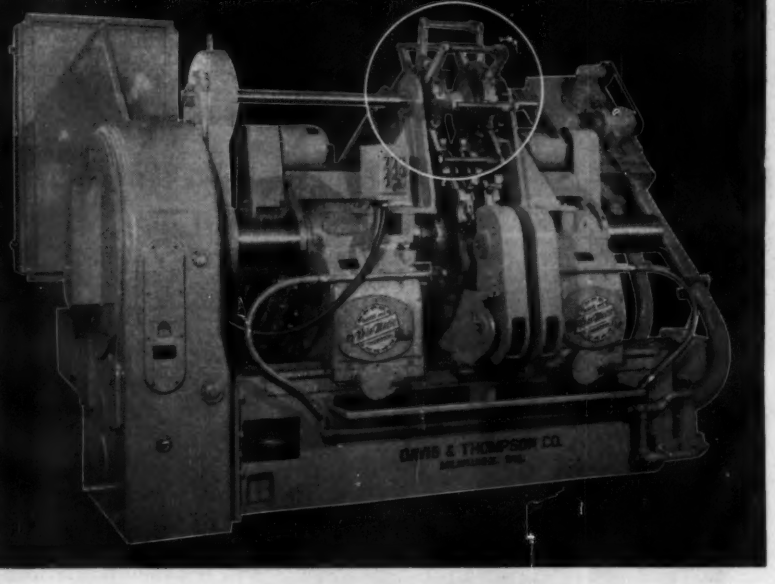

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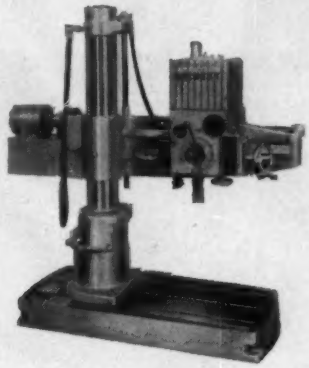

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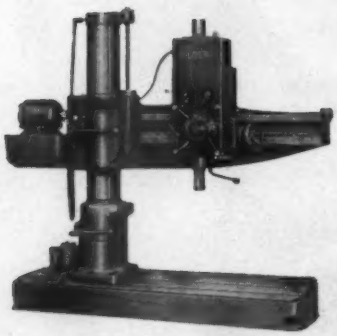

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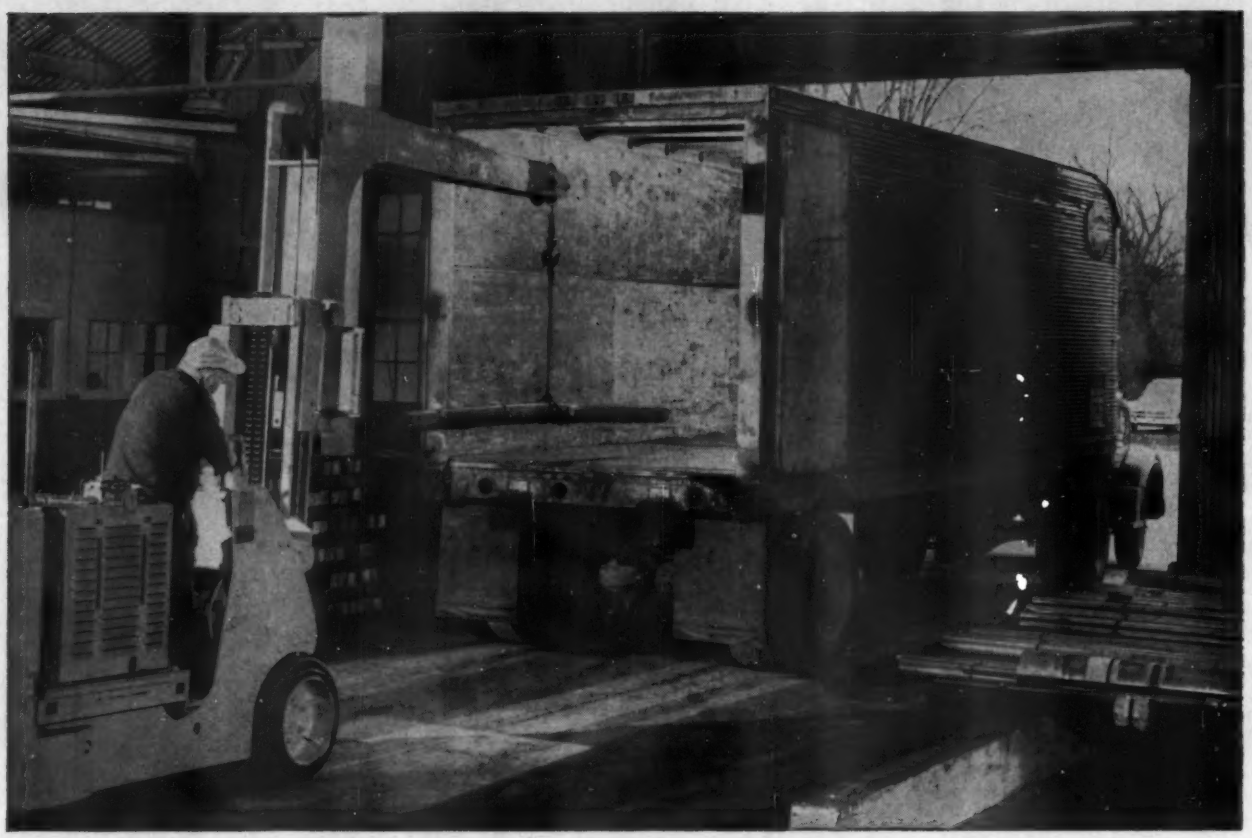

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